

**MALCOLM
PIRNIE****POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT**

NJ0981082902

Elizabeth Coal Gas # 2

239

Site Name

Site ID Number

406 South Street,

Elizabeth, Union, New Jersey

Address

City, State

Date of Off-Site Reconnaissance March 7, 1985**SITE DESCRIPTION**

The South Street Gas Works began operation in 1855 and from all accounts manufactured producer gas and coal gas. Gasification operations ceased in 1901 with all manufacturing facilities most likely withdrawn from service. Presently, at least two brick buildings of the former plant still exist and are being utilized for storage by the Vignola Salvage Corp. The Army Corps of Engineers has recently removed and regraded portions of the site to the west under the viaduct, and to the south near a storm water control area and baseball field.

PRIORITY FOR FURTHER ACTION: High X Medium ____ Low ____ None ____**RECOMMENDATIONS**

A high priority is recommended at this time given the proximity of residences and strong potential for direct human exposure to materials possibly disposed of in an area presently utilized as a baseball field. As an initial step to characterize the nature and potential of on-site hazards to local residents, a site investigation should be scheduled to collect soil samples and perform soil borings in the areas accessible to the public. Surface water samples from the retention basin adjacent to the western site boundary should also be collected and screened for coal gasification associated waste materials.

Prepared by: Anthony M. RussoDate: March 23, 1985Of: Malcolm Pirnie



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
NJ 239

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site) Elizabeth Coal Gas # 2		02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER 406 South Street			
03 CITY Elizabeth	04 STATE NJ	05 ZIP CODE 07202	06 COUNTY Union	07 COUNTY CODE	08 CONG. DIST.
09 COORDINATES LATITUDE 40 39 29.3 LONGITUDE 74 12 32.2		BLOCK 9 LOT 1151			
10 DIRECTIONS TO SITE (Starting from nearest public road) New Jersey Turnpike to No. Ave exit. Take No. Ave. West to Spring St. south. Follow Spring St. to So. Spring St. and South St. The site will be located on left side under viaduct.					

III. RESPONSIBLE PARTIES

01 OWNER (if known) Vignola Salvage Corp.		02 STREET (Business, mailing, residential) 406 South Street			
03 CITY Elizabeth	04 STATE NJ	05 ZIP CODE 07202	06 TELEPHONE NUMBER (201)-3553165		
07 OPERATOR (if known and different from owner) Elizabethtown Gas Co.		08 STREET (Business, mailing, residential) One Elizabethtown Plaza			
09 CITY Elizabeth	10 STATE NJ	11 ZIP CODE 08830	12 TELEPHONE NUMBER (201)-2895000		

13 TYPE OF OWNERSHIP (Check one)

- ☒ A. PRIVATE ☐ B. FEDERAL ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL
(Agency name)
☐ F. OTHER ☐ G. UNKNOWN
(Specify)

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)

- ☐ A. RCRA 3001 DATE RECEIVED: MONTH DAY YEAR ☐ B. UNCONTROLLED WASTE (CERCLA 103c) DATE RECEIVED: MONTH DAY YEAR ☒ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION <input type="checkbox"/> YES DATE MONTH DAY YEAR <input checked="" type="checkbox"/> NO CONTRACTOR NAME (S)		BY (Check all that apply) <input type="checkbox"/> A. EPA <input type="checkbox"/> B. EPA CONTRACTOR <input type="checkbox"/> C. STATE <input type="checkbox"/> D. OTHER CONTRACTOR <input type="checkbox"/> E. LOCAL HEALTH OFFICIAL <input type="checkbox"/> F. OTHER (Specify)			
02 SITE STATUS (Check one) <input type="checkbox"/> A. ACTIVE <input checked="" type="checkbox"/> B. INACTIVE <input type="checkbox"/> C. UNKNOWN		03 YEARS OF OPERATION 1855 1901 BEGINNING YEAR ENDING YEAR <input type="checkbox"/> UNKNOWN			

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED

Substances most likely associated with operation of the So. Street gas works include tar oils, heavy metals, phenols, phthalates, cyanides, and polynuclear aromatic hydrocarbons (PAH's).

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION

Potential soil and groundwater contamination from tar and oil residue. Access to a ballfield at the rear of the site creates potential for direct human contact with contaminated soil.

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste information and Part 3 - Description of Hazardous Conditions and Incidents)

- ☒ A. HIGH (inspection required promptly) ☐ B. MEDIUM (inspection required) ☐ C. LOW (inspection on time available basis) ☐ D. NONE (No further action needed, complete current disposition form)

VI. INFORMATION AVAILABLE FROM

01 CONTACT Fred Schmitt		02 OF (Agency/Organization) NJDEP-BEERA		03 TELEPHONE NUMBER (609)-2921215	
04 PERSON RESPONSIBLE FOR ASSESSMENT Anthony M. Russo		05 AGENCY	06 ORGANIZATION M. Pirnie, Inc	07 TELEPHONE NUMBER (914)-6942100	08 DATE 3/13/85 MONTH DAY YEAR



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2- WASTE INFORMATION

I. IDENTIFICATION

01 STATE NJ 02 SITE NUMBER

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- ☒ A. SOLID ☐ E. SLURRY
☒ B. POWDER, FINES ☒ F. LIQUID
☐ C. SLUDGE ☒ G. GAS
☒ D. OTHER (Specify)

02 WASTE QUANTITY AT SITE
(Measures of waste quantities must be independent)

TONS unknown
CUBIC YARDS
NO. OF DRUMS

03 WASTE CHARACTERISTICS (Check all that apply)

- ☒ A. TOXIC ☒ E. SOLUBLE ☒ I. HIGHLY VOLATILE
☐ B. CORROSIVE ☐ F. INFECTIOUS ☐ J. EXPLOSIVE
☐ C. RADIOACTIVE ☒ G. FLAMMABLE ☒ K. REACTIVE
☒ D. PERSISTENT ☐ H. IGNITABLE ☐ L. INCOMPATIBLE
☐ M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS	unknown		
PSO	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS	unknown		
IOC	INORGANIC CHEMICALS	unknown		
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS	unknown		

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
IOC	Ammonia	7664-41-7	*Storage/disposal method is		
IOC	Ammonium Sulphate	7799	unknown. See Attachment for		
IOC	Coke	65996-77-2	a more complete listing/		
IOC	Sulfur	7704-34-9	description of associated		
IOC	Cyanides	7799	coal gasification waste		
OCC	Coal Tar Pitch	65996-93-2	materials.		
OCC	Phenols	7799			
OCC	Amines	7799			
OCC	Coal Tar	8007-45-2			
OCC	Anthracene	120-12-7			
OCC	Napthalene	91-20-3			
OCC	Pyrene	129-00-0			
SOL	Benzene	71-43-2			
SOL	Toluene	108-88-3			
MES	Heavy Metals	7799			

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

NJDEP/HSMA: The compounds listed above should be considered a generic list of constituents commonly found in coal gasification waste products. Site-specific sample must be taken to characterize the actual contaminants on a particular site.



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT

PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE NJ 02 SITE NUMBER 239

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☒ A. GROUNDWATER CONTAMINATION 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

Rapid infiltration of rainfall through uncovered soil on southern boundary may accelerate the transport rate of buried contaminants to groundwater beneath the site.

01 ☒ B. SURFACE WATER CONTAMINATION 02 ☒ OBSERVED (DATE: 3/7/85) ☐ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

An oily sheen was visible on the surface of a small retention basin adjacent to the western site boundary. Although a small chain link fence surrounds it, access and direct contact is possible.

01 ☒ C. CONTAMINATION OF AIR 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

Contaminants sorbed to soil and dust particles may become suspended in air and blown off-site.

01 ☒ D. FIRE/EXPLOSIVE CONDITIONS 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

Potential in areas where pooled underground deposits of oil and tar residue are adjacent to buried electric cables or heat sources.

01 ☒ E. DIRECT CONTACT 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

Potential for both worker and residential contact with contaminated soils.

01 ☒ F. CONTAMINATION OF SOIL 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED

03 AREA POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

Potential exists resulting from the spillage, leakage or open pit storage of tar and oil waste.

01 ☐ G. DRINKING WATER CONTAMINATION 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

01 ☒ H. WORKER EXPOSURE/INJURY 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED

03 WORKERS POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

Potential through dermal and inhalation exposure routes by workers of the Vignola Salvage Corp.

01 ☒ I. POPULATION EXPOSURE/INJURY 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

Neighborhood residents are currently using a baseball field located on property which may have been part of the former coal gasification waste disposal/storage area.



POTENTIAL HAZARDOUS WASTE SITE
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PART 3-DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
NJ 239

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J. DAMAGE TO FLORA

02 ☐ OBSERVED (DATE: _____)

☐ POTENTIAL

☐ ALLEGED

04 NARRATIVE DESCRIPTION

01 ☐ K. DAMAGE TO FAUNA

02 ☐ OBSERVED (DATE: _____)

☐ POTENTIAL

☐ ALLEGED

04 NARRATIVE DESCRIPTION (Include name(s) of species)

01 ☐ L. CONTAMINATION OF FOOD CHAIN

02 ☐ OBSERVED (DATE: _____)

☐ POTENTIAL

☐ ALLEGED

04 NARRATIVE DESCRIPTION

01 ☒ M. UNSTABLE CONTAINMENT OF WASTES

(Spills/runoff/standing liquids/leaking drums)

02 ☐ OBSERVED (DATE: _____)

☒ POTENTIAL

☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

Tar and oil residues buried on-site are most likely contained in unlined pits or as pockets of contaminated ground water and soil.

01 ☐ N. DAMAGE TO OFFSITE PROPERTY

02 ☐ OBSERVED (DATE: _____)

☐ POTENTIAL

☐ ALLEGED

04 NARRATIVE DESCRIPTION

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs

02 ☐ OBSERVED (DATE: _____)

☐ POTENTIAL

☐ ALLEGED

04 NARRATIVE DESCRIPTION

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING

02 ☐ OBSERVED (DATE: _____)

☐ POTENTIAL

☐ ALLEGED

04 NARRATIVE DESCRIPTION

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: _____

IV. COMMENTS

The quantity, location, and nature of waste materials possibly buried on-site are presently unknown. An assessment of the magnitude and extent of potential hazards can only be generally concluded at this time.

V. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

NJDEP/HSMA: Attachments A,B

Sax: Attachment C

NJDEP/DWM: Attachment D



QUAD ELIZABETH
SITE 239

Lat: 40° 39' 29.3" Long: 74° 12' 32.2"

ELIZABETH

GAS WORKS #2
(So. ST. GAS WORKS)

LINDEN

ARTHUR

ATTACHMENT A
NJ DEP INFORMATION REQUEST
SOUTH ST. GAS WORKS
ELIZABETH, N.J.

I. SITE BACKGROUND

1. Location: 406 South St., Elizabeth, N.J.
(See attached map)
2. Site Description
 - a. See attached sketch
 - b. (Two brick buildings are on the site; one is used for offices, the other for storage. The yard is bare soil and some of the foundations of former structures are visible.)
3. History of Ownership and Use *MAP INDICATES COAL GAS MANUFACTURING NOT PRODUCER GAS.*
 - a. (Elizabethtown Gas Co. has owned the property since 1855. Producer gas was manufactured from 1855 to approximately 1901. See plant drawings for 1903.)
 - b. (Waste handling practices from past operations are unknown. Since there was a market for waste material, we presume that much of it was sold and transported off-site by horse-drawn cart.)
 - c. (It is probable that some wastes may remain on the site although the areas where accumulations of wastes would be expected have been removed by the Army Corps of Engineers.)
 - d. (The Army Corps of Engineers recently removed and re-graded portions of the property to the west, under Route 1 and to the south. This property had been taken by condemnation by the City of Elizabeth in 1978 and 1980 and it is believed that the bulk of the wastes which may have been deposited on site, were on these portions of the property.)
 - e. There have been no regulatory violations issued to date.
4. At the present time there are no plans proposed for the future use of this site.

II. SITE CHARACTERISTICS

A. Land Use

1. The South Street property is near the center of the City of Elizabeth and the land use within a 2 mile radius is commercial, industrial and urban residential. In the immediate vicinity of the property is urban residential from Northeast to Southeast, a stormwater retention basin to the South and West and an industrialized area to the North. Route 1 passes directly overhead on the West side of the property. (See sketch for 1.2.a.)
2. The population density within a 2 mile radius is approximately 9,000 people per square mile.
3. The site is completely secured by chain link fence and masonry wall, topped with barbed wire.

B. Site Terrain

1. Average slope of the site is less than 2% (See topographic map.)
2. The nearest downslope surface water is the Elizabeth River which is channelized by concrete bulkheads at this point on the river. There is no known use of this river other than drainage.
3. There is a difference of approximately 3 or 4 feet between the edge of the property and the bottom of the stormwater retention basin. The elevation drops rapidly at the edge of the basin but is relatively flat within the basin which is then bordered on the far side by the concrete bulkhead.
4. The approximate elevation of the site is 12-14 feet above sea level.

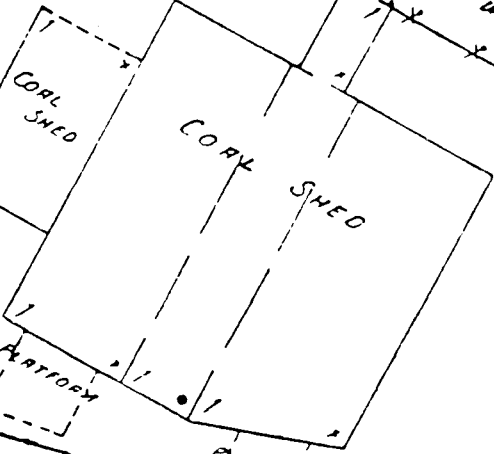
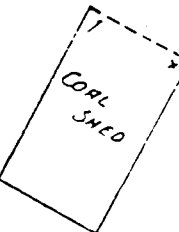
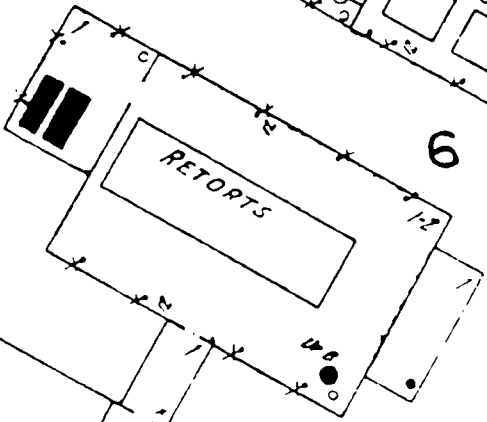
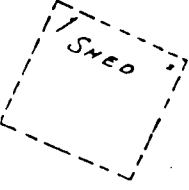
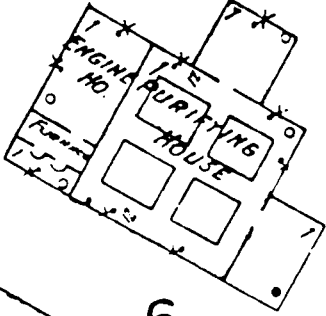
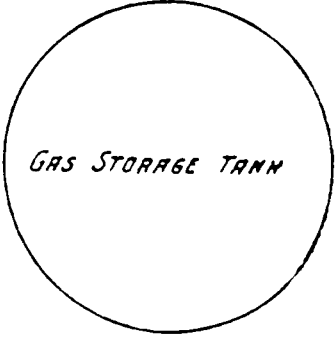
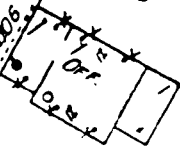
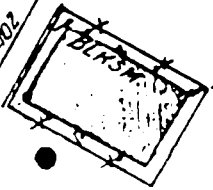
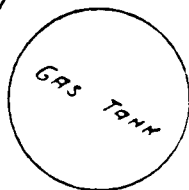
C. Ground and Surface Water Use

1. There are no known uses of the aquifer underlying the site within a three mile radius. Our search did not indicate any well records.
2. There are no known potable wells within 3 miles of the site.
3. There are no water supply wells within 3 miles of the site.
4. Uses of surface water within 3 miles downstream of the site are restricted to shipping.

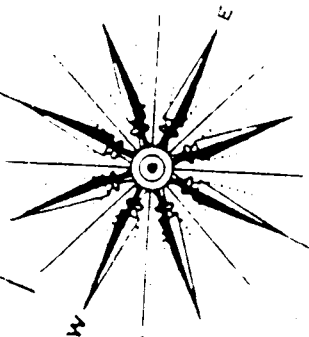
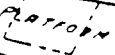
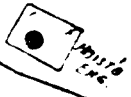
37

60'

SOUTH



ELIZABETHTOWN GAS LIGHT CO
MFRS OF COAL GAS 1903
 LIGHT MATCHES NO CLOCK, POWER & HEAT STEAM
 LIGHTS GAS NO FIRE GAPS



E 1 1 2 8

A-3

28

FORMER GAS MANUFACTURING PLANTS

SITE: #2, Elizabeth, NJ

LOCATION: 406 South St.

SIZE: 2.7 acres

PRESENT OWNERSHIP: Elizabethtown Gas Co. since 1855 and
City of Elizabeth by condemnation in 1978 and 1980

PRIOR OWNERSHIP:

WELLS: None in vicinity

WATER COURSES: Elizabeth River - rerouted through property

HEALTH DEPT.: City of Elizabeth

PRESENT LAND USE: Storage, Light Industrial-Commercial

ADJACENT LAND USE: Residential
Light Industrial Storage
Public Recreation

APPROXIMATE DATES OF PLANT OPERATION: Until 1901

ATTACHMENT B

I. PROCESS DESCRIPTION AND BY-PRODUCT & WASTE HANDLING

A. Process Description

1. Oil Gas

Oil gas is the thermal cracking and reforming of a liquid hydrocarbon. Oil gas is produced in a three vessel system similar to the carbureted water gas machines. Checker brick replaces the coke bed in the generator and the generator and carburetor are used as vaporizers. The vaporizers are alternately heated with a liquid fuel and process another liquid fuel into the superheater where the thermally cracked hydrocarbon is reformed into methane, ethane, ethylene and other higher hydrocarbons. Oil gas has a thermal value of approximately 1100 Btu/ft. The by-product from this process is tar.

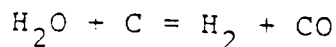
2. Coal Gas

Coal gas is manufactured through the thermo-decomposition of the volatile matter in coal. It is generated in equipment called retorts, benches and coke ovens. The coal gas produced from the thermo-decomposition is high in hydrogen and methane and contains lesser amounts of ethane, ethylene, ammonia, hydrogen sulfide, water, carbon monoxide, carbon dioxide, tar, fixed carbon, and other hydrocarbons.

The by-products of coal gasification are ammonia, ammonium sulphate, tar, light oils, coke and sulfur.

3. Water Gas

Water gas is manufactured by passing steam over and through an incandescent bed of hot coke, coal or other carbonaceous material. The manufacturing equipment consists of a generator, waste heat boiler and a wash box. The generator contains the coke bed; the waste heat boiler is used to extract heat from the gas produced or from the products of combustion when heating the coke bed and the wash box is used to cleanup the gas of all condensables. Water gas consists essentially of hydrogen and carbon monoxide which is formed in the following chemical reaction.



The thermal value of water gas is approximately 380 Btu/ft. The by-product from water gas manufacturing is ash and clinker.

4. Carbureted Water Gas

Carbureted water gas is the water gas process enriched with a thermally cracked hydrocarbon such as oil, natural or liquified petroleum gas. The manufacturing equipment consists of a generator, carburetor, superheater, waste heat boiler and wash box. The generator contains the coke bed used for generating the water gas and providing heat to the carburetor and superheater. The carburetor is where the hydrocarbon is added, usually vaporizing and being thermally cracked on checker brick installed in the carburetor. The superheater, also filled with checker brick, is where the thermally cracked hydrocarbon is reformed into methane, ethane and other gaseous hydrocarbons. The thermal value of carbureted water gas is approximately 560 Btu/ft. The by-products from the carbureted water gas reaction are clinker, tar, pitch, and light oil.

B. By-Products and Waste Handling

1. Ash

Ash, the residue remaining from the burning of soft and hard coals, was generated in the steam producing portion of all gas plants up to about 1945, when the boilers were converted to liquid fuels.

Ash was normally removed from the property in bulk by contractors who trucked the material to landfills.

2. Clinker

Clinker is the residue remaining from the coke used in the water gas and carbureted water gas operations.

Clinker was normally removed and disposed of in the same fashion as ash.

3. Iron Oxide Sponge

Iron Oxide Sponge was used in all gas plants for the removal of hydrogen sulfide from the manufactured gas stream. The sponge was normally regenerated with air to reactivate

the material. However, over the years great quantities of this material became waste because it could no longer be regenerated.

Spent Iron Oxide Sponge was normally removed from the property in bulk by contractors.

4. Coke

Coke was a by-product from the coal gas plants the result of the thermo decomposition of coal. Coke was sold to the gas industry, the steel industry, residential, commercial, and industrial consumers who utilized it for fuel.

Coke was transported from the plants via barge, rail and trucks. In some instances, it was bagged for retail sale.

5. Water Gas, Carbureted Water Gas & Oil Gas Tar

Tar was removed from the manufactured gas stream usually as an emulsion with water. It was initially stored in tar wells (separators) and tanks where the water was removed. Tar was sold to the road paving industry, the building material industry, and was used in-plant for boiler fuel.

Tar was transported via tank truck, rail car, and barge to the above listed industries.

6. Coal Gas Tar

Tar was removed from the manufactured gas stream in the ammonia liquor stream. Dry tar was separated from the ammonia liquor and stored in tanks. The tar was then sold to the chemical industry for recovery of the valuable chemicals in the tar by-product. After chemical recovery, the remaining tar was sold principally to the paving industry.

Tar was transported from the plants via tank truck, rail car, and barge to the chemical industry.

7. Pitch

Pitch or tar heavies resulted from the processing of tar for the paving industry.

This by-product was sold to the electrolytic industry, both domestic and foreign, for the manufacture of electrodes.

Pitch was transported from the plants via trucks or barge. Foreign bound pitch was transported via truck to ships for sea transportation.

8. Drip Oil or Light Oil

Drip oil was removed from the manufactured gas stream usually by condensers and precipitators, collected, processed for water removal, and stored in tanks. Coal gas drip oil was sold to the chemical industry, whereas carbureted water gas drip oil was mixed with the tar by-product and sold with the tar.

Drip oil, when sold independently, was transported from the plant via tank truck.

9. Ammonium Sulphate

Ammonium sulphate was removed from the manufactured coal gas stream usually in a liquid purification system. The sulphate was dried and stored in buildings for sale to the fertilizer industry.

The material was shipped from the plant in bulk via truck or barge to the various fertilizer plants.

10. Flotation Sulfur

Flotation sulfur was removed from the manufactured coal gas stream by a liquid purification system. The sulfur was then further dried in presses and loaded into wooden barrels for sale as a pesticide to individual farmers or farm cooperatives for spraying on fruit trees.

The sulfur barrels were transported via truck or barge to their destination.

11. Ammonia Liquor

Ammonia liquor was the result of washing the manufactured coal gas stream with water. The liquor was then disposed of prior to 1950 by mixing with cooling water effluent and discharged

to the nearest waterway. After 1950, this
effluent was discharged to the local sewer plants.

indicate moderate toxicity. Ingestion causes gastric irritation.

Explosion Hazard: Slight, when exposed to heat or by spontaneous chemical reaction (hydrolysis); in a hot acid solution this material can undergo spontaneous hydrolysis liberating much heat.

Disaster Hazard: Dangerous. See sulfonates.

Countermeasures

Storage and Handling: Section 7.

AMMONIUM SULFATE

General Information

Brownish-gray to white crystals.

Formula: $(\text{NH}_4)_2\text{SO}_4$.

Mol wt: 132.09, mp: $> 280^\circ\text{C}$ (decomp.), d: 1.77.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 1; Ingestion 1; Inhalation 1.

Acute Systemic: U.

Chronic Local: U.

Chronic Systemic: U.

A general purpose food additive (Section 10).

Disaster Hazard: Dangerous. See sulfates.

AMMONIUM SULFHYDRATE

General Information

Synonyms: ammonium hydrosulfide; ammonium hydrogen sulfide.

Powder or crystals.

Formula: NH_4HS .

Mol wt: 51.11, mp: 118°C (150 atm), d: 1.17, vap. press.: 400 mm at 21.8°C .

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 3; Ingestion 3; Inhalation 3.

Acute Systemic: Ingestion 3; Inhalation 3; Skin Absorption 3.

Chronic Local: U.

Chronic Systemic: U.

Toxicity: Highly irritating. Penetrates skin readily.

Fire Hazard: See sulfides.

Disaster Hazard: See sulfides.

Explosion Hazard: See sulfides.

Countermeasures

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by IATA.

AMMONIUM SULFIDE

General Information

Synonym: ammonium polysulfide.

Yellow, hygroscopic crystals.

Formula: $(\text{NH}_4)_2\text{S}$.

Mol wt: 68.2, mp: decomposes.

Hazard Analysis

Toxicity: See sulfides. Evolves H_2S on contact with acid or acid fumes. Fatal poisoning has been reported from use in hair waving lotion.

Fire Hazard: See sulfides.

Explosion Hazard: See sulfides.

Disaster Hazard: See sulfides.

Countermeasures

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by IATA.

AMMONIUM SULFITE

General Information

Colorless crystals.

Formula: $(\text{NH}_4)_2\text{SO}_3 \cdot \text{H}_2\text{O}$.

Mol wt: 134.16, mp: $60-70^\circ\text{C}$ (decomp.), bp: sub. at 150°C , d: 1.41 at 25°C .

* This material has been assigned a Threshold Limit Value by ACGIH. See complete reprint of TLV's in Section 1.

Hazard Analysis and Countermeasures

See sulfites.

AMMONIUM SULFOCYANATE. See ammonium thiocyanate.

AMMONIUM TELLURATE

General Information

White powder.

Formula: $(\text{NH}_4)_2\text{TeO}_6$.

Mol wt: 227.7, mp: decomposes, d: 3.01 at 25°C .

Hazard Analysis and Countermeasures

See tellurium compounds.

AMMONIUM TETRABORATE. See ammonium borate.

AMMONIUM TETRACHLOROZINCATE

General Information

White, thin, shiny platelets. Hygroscopic and water sol.

Formula: $\text{ZnCl}_2 \cdot 2\text{NH}_4\text{Cl}$.

Mol wt: 243.3, mp: 150°C (approx.), d: 1.879.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2; Ingestion 2; Inhalation 2.

Acute Systemic: U.

Chronic Local: Irritant 1.

Chronic Systemic: U.

Toxicology: Effects are those of components: zinc chloride and ammonium chloride, both of which are irritants and are described under appropriate headings.

Disaster Hazard: Dangerous. See chlorides.

AMMONIUM THALLIUM CHLORIDE

General Information

Colorless crystals.

Formula: $3\text{NH}_4\text{Cl} \cdot \text{ThCl}_4 \cdot 2\text{H}_2\text{O}$.

Mol wt: 507.3, d: 2.39.

Hazard Analysis and Countermeasures

See thallium compounds and chlorides.

AMMONIUM THIOANTIMONATE

General Information

Yellow crystals.

Formula: $(\text{NH}_4)_3\text{SbS}_4 \cdot 4\text{H}_2\text{O}$.

Mol wt: 376.2, mp: decomposes.

Hazard Analysis

Toxicity: See antimony compounds.

Disaster Hazard: Dangerous; when heated to decomposition or on contact with acid or acid fumes, it emits highly toxic fumes of SO_2 and Sb.

Countermeasures

Storage and Handling: Section 7.

AMMONIUM THIOCYANATE

General Information

Synonym: ammonium sulfocyanate.

Colorless solid, or deliquescent crystals.

Formula: NH_4SCN .

Mol wt: 76.1, mp: 149.6°C , bp: decomposes at 170°C , d: 1.305.

Hazard Analysis

Toxicity: A herbicide. See thiocyanates.

Disaster Hazard: See thiocyanates.

Countermeasures

Storage and Handling: Section 7.

AMMONIUM THIOGLYCOLATE

General Information

Colorless liquid, strong skunklike odor.

Formula: $\text{HSCH}_2\text{COONH}_4$.

Mol wt: 109.1.

Hazard Analysis

Note: For an in-depth discussion of storage and handling and control of fires see Section 7.

Toxic Hazard Rating:
Acute Local: Irritant 1; Inhalation 2.

Acute Systemic: Ingestion 3; Inhalation 2.

Chronic Local: Allergen 2.

Chronic Systemic: Inhalation 2.

Caution: Emits hydrogen sulfide.

It can cause a contact dermatitis.

Disaster Hazard: Dangerous; on contact with acid or on contact with acid fumes it emits highly toxic fumes of SO_2 .

Countermeasures

Ventilation Control: Section 2.

Personal Hygiene: Section 2.

Storage and Handling: Section 7.

AMMONIUM THIOSULFATE

General Information

White, monoclinic crystals.

Formula: $(\text{NH}_4)_2\text{S}_2\text{O}_3$.

Mol wt: 148.2, d: 1.679, mp: 150°C .

Hazard Analysis

Toxicity: See thiosulfates.

Disaster Hazard: Dangerous; on contact with acid or on contact with acid fumes it emits highly toxic fumes of SO_2 .

Countermeasures

Storage and Handling: Section 7.

AMMONIUM TRICHLOROARSENATE

General Information

Colorless crystals.

Formula: $\text{NH}_4\text{O}_2\text{AsCl}_4$.

Mol wt: 180.6.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2; Ingestion 2; Inhalation 2.

Acute Systemic: U.

Chronic Local: Possible carcinogen.

Chronic Systemic: Possible carcinogen.

A herbicide.

Disaster Hazard: Dangerous; on contact with acid or on contact with acid fumes it emits toxic or corrosive fumes.

Countermeasures

Ventilation Control: Section 2.

Storage and Handling: Section 7.

AMMONIUM TRIIODIDE

General Information

Dark crystals.

Formula: NH_4I_3 .

Mol wt: 398.8, d: 3.749.

Hazard Analysis and Countermeasures

See iodides.

AMMONIUM URANIUM FLUORIDE

General Information

Colorless crystals.

Formula: $2(\text{NH}_4)_2\text{CO}_3 \cdot \text{UO}_2\text{F}_2 \cdot 2\text{H}_2\text{O}$.

Mol wt: 558.3, mp: decomposes at 200°C .

Hazard Analysis

Toxicity: See uranium compounds.

Disaster Hazard: See uranium.

AMMONIUM URANYL CARBONATE

General Information

Yellow crystals.

Formula: $2(\text{NH}_4)_2\text{CO}_3 \cdot \text{UO}_2\text{CO}_3 \cdot 2\text{H}_2\text{O}$.

Mol wt: 558.3, mp: decomposes at 200°C .

Hazard Analysis

Toxicity: See uranium compounds.

Disaster Hazard: See uranium.

TOXIC HAZARD

None (a) No harm under any conditions.

Under unusual conditions or after end of exposure.

Causes readily reversible effects.

MODERATE. May involve both

ATTACHMENT C

C-1

Countermeasures

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

CLEANING CONTAMINATED AIR is discussed in Section 2.**CLEANING SOLVENTS (KEROSENE CLASS)**

See stoddard solvent.

CLEANING SOLVENTS, 140°F CLASS**General Information**Insol. in H₂O.

Flash pt.: 138.2°F or higher, autoign. temp.: 453.2°F or higher; lel = 0.8% at 302°F; bp (initial): 181°C or higher.

Hazard Analysis

Fire Hazard: Moderate, when exposed to heat or flame.

Countermeasures

Storage and Handling: Section 7.

CLINICAL MEDICINE AFFECTED BY INDUSTRIAL TOXICOLOGY. See Section 9.**"CLOROX."** See hypochlorites.**CLYSMATE.** See 4-chloro benzenesulfonic acid, chlorophenyl ester.**CMC.** See sodium carboxymethyl cellulose.**CM CELLULOSE.** See sodium carboxymethyl cellulose.**CMU.** See monuron.**COAL BRIQUETTES, HOT.** See also carbon.

Shipping Regulations: Section 11.

Regulated by CG, DOT.

COAL CREOSOTE

A recognized carcinogen, Section 8. See creosote.

COAL DUST. See anthracite particles.**Countermeasures**

Shipping Regulations: Section 11.

Regulated by IATA.

COAL GAS**General Information**

Contains hydrogen, methane, carbon monoxide, etc.

LeI = 5.3%, uel = 31%, autoign. temp.: 1200°F.

Hazard Analysis

Toxicity: Highly toxic. See carbon monoxide.

Fire Hazard: Dangerous. See hydrogen.

Explosion Hazard: Moderate, when exposed to heat or flame.

Disaster Hazard: Dangerous. See hydrogen, methane.

Countermeasures

Storage and Handling: Section 7.

To Fight Fire: Stop flow of gas. Carbon dioxide, dry chemical or water spray (Section 7).

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

COAL, GROUND BITUMINOUS, SEA COAL, COAL FACINGS, ETC.**General Information**

Black powder or chunks.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Inhalation 1.

Acute Systemic: 0.

Chronic Local: Inhalation 1.

Chronic Systemic: Inhalation 2.

Fire Hazard: Moderate, when exposed to heat; can react with oxidizing materials (Section 7).

Spontaneous Heating: Moderate.

Explosion Hazard: Slight, when exposed to flame.

Countermeasures

Ventilation Control: Section 2.

Shipping Regulations: Section 11.

Regulated by CG, DOT.

COALITES. See explosives, high.**COAL NAPHTHA.** See benzene.**COAL SPECIALS.** See explosives, high.**COAL TAR****General Information**

Black, viscous liquid.

Composition: benzene, toluene, naphthalene, anthracene, xylene, phenol, cresol, ammonia, pyridine, thiophene, etc.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 1; Allergen 1; Ingestion 1; Inhalation 1.

Acute Systemic: Inhalation 2.

A recognized carcinogen (Section 8). See coal tar and pitch.

Fire Hazard: Moderate, when exposed to heat (Section 7).

Explosion Hazard: Moderate, when vapor is exposed to heat or flame.

Disaster Hazard: Dangerous; when heated to decomposition, it emits highly toxic fumes; can react with oxidizing materials.

Countermeasures

Ventilation Control: Section 2.

Personnel Protection: Section 2.

Storage and Handling: Section 7.

COAL TAR ACID OIL

A recognized carcinogen (Section 8). See coal tar and pitch.

COAL TAR AND PITCH

A recognized carcinogen of the skin, scrotum, lip, larynx and lungs. Also an experimental carcinogen of the bladder (Section 8).

COAL TAR AND PRODUCTS

A recognized carcinogen (Section 8). See aromatic amines.

COAL TAR DISTILLATE**Hazard Analysis**

Toxic Hazard Rating:

Acute Local: Allergen 1; Ingestion 2; Inhalation 2.

Acute Systemic: Inhalation 2.

Chronic Local: Allergen 2.

Chronic Systemic: Inhalation 3; Skin Absorption 3.

A recognized carcinogen (Section 8). See coal tar and pitch.

Fire Hazard: Dangerous, when exposed to heat or flame; it can react vigorously with oxidizing materials (Section 7).

TOXIC HAZARD RATING CODE (For detailed discussion, see Section 9.)

1 NONE: (a) No harm under any conditions; (b) Harmful only under unusual conditions or overwhelming dosage.

2 MIGHT: Causes readily reversible changes which disappear after end of exposure.

3 MODERATE: May involve both irreversible and reversible changes not severe enough to cause death or permanent injury.

4 HIGH: May cause death or permanent injury after very short exposure to small quantities.

U UNKNOWN: No information on humans considered valid by authors.

classes have caused injury to the liver, kidney and brain.

AMIDOL

General Information

Synonym: diaminophenol hydrochloride.

Grayish white crystals.

Formula: $C_6H_7N_2O \cdot 2HCl$.

Mol wt: 197.07.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 1; Allergen 1.

Acute Systemic: U.

Chronic Local: Allergen 1.

Chronic Systemic: U.

Disaster Hazard: dangerous; see chlorides.

Countermeasures

Personal Hygiene: Section 2.

Storage and Handling: Section 7.

Synonym: 3-amino-2,5-dichlorobenzoic acid.

"AMINE 220"

General Information

Liquid.

Formula: $C_{11}H_{13}N_2CNC_6H_4NC_6H_4OH$.

Mol wt: 350; bp: 235°C at 1 mm, flash p.: 465°F (0°C); d: 0.9300 at 20°/20°C, vap. d.: 12.1.

Hazard Analysis

Toxicity: Details unknown.

Fire Hazard: Slight, when exposed to heat or flame; can react with oxidizing materials. Section 7.

Countermeasures

To Fight Fire: Foam, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

Storage and Handling: Section 7.

AMINES. See also specific compounds

General Information

A large group of organic compounds, containing nitrogen and considered as being derived from ammonia (NH_3) by replacement of one or more H atoms by an organic radical.

Hazard Analysis

Toxicity: Variable; some are highly toxic, others only slightly. Many are skin irritants and some are sensitizers. See Aromatic amines and also fatty amines. Amines are common air contaminants.

AMINOACETANILIDE

General Information

Synonym: acetyl-*p*-phenylenediamine.

White to reddish crystals.

Formula: $NH_2C_6H_4NHC(=O)CH_3$.

Mol wt: 150.2, mp: 164°C.

Hazard Analysis

Toxicity: Details unknown. See *p*-phenylene diamine.

Disaster Hazard: Moderately dangerous; when heated to decomposition it emits toxic fumes.

Countermeasures

Storage and Handling: Section 7.

AMINOACETIC ACID. See glycine.

o-AMINOACETOPHENONE

General Information

Synonym: *o*-aminoacetyl benzene.

Yellow, oily liquid.

Formula: $CH_3COC_6H_4NH_2$.

Mol wt: 135.2, bp: 250–252°C (slight decomp.).

Hazard Analysis

Toxicity: Moderate. See amines.

Fire Hazard: Slightly dangerous (Section 7).

Countermeasures

Storage and Handling: Section 7.

o-AMINOACETYL BENZENE. See *o*-aminoacetophenone.

α-AMINOANTHROQUINONE

General Information

Synonym: 1-amino anthroquinone.

Ruby red crystals; insol. in water; sol. in alcohol, benzene, chloroform, ether, glacial acetic acid, hydrochloric acid.

Formula: $C_{14}H_9(CO_2)_2C_6H_4NH_2$ (tri-cyclic).

Mol wt: 223.22, mp: 253°C, bp: sublimes.

Hazard Analysis

Toxicity: Has produced anemia and degenerative changes in liver and kidneys of experimental animals. A sensitizer.

p-AMINOAZOBENZENE

General Information

Synonym: *p*-phenylazoaniline.

Yellow crystals.

Formula: $C_6H_5NNC_6H_4NH_2$.

Mol wt: 197.2, bp: > 360°C, mp: 128°C.

Hazard Analysis

Toxicity: Details unknown; see aniline.

Fire Hazard: Unknown.

Disaster Hazard: Moderately dangerous; when heated to decomposition, it emits toxic fumes.

Countermeasures

Storage and Handling: Section 7.

o-AMINOAZOTOLUENE

General Information

Synonym: 2-amino-5-azotoluene; solvent yellow 3; tol-*u*azotoluidine.

Reddish brown to yellow crystals; sol. in alcohol, ether, oils, and fats; slightly sol. in water.

Formula: $CH_3C_6H_4N_2C_6H_4NH_2CH_3$.

Mol wt: 225.3, mp: 102°C.

Hazard Analysis

Toxicity: Details unknown. Has produced cancer of the liver experimentally in rats and mice. Section 8.

Fire Hazard: Unknown.

Disaster Hazard: Moderately dangerous; when heated to decomposition, it emits toxic fumes.

Countermeasures

Storage and Handling: Section 7.

AMINOAZOTOLUENE HYDROCHLORIDE

General Information

Synonym: 2-amino-5-azotoluene hydrochloride.

Crystals.

Formula: $C_{11}H_{11}N_3 \cdot HCl$.

Mol wt: 260.8.

Hazard Analysis

Toxicity: Details unknown: See also *o*-aminoazotoluene.

Disaster Hazard: dangerous; See chlorides.

Countermeasures

Storage and Handling: Section 7.

TOXIC HAZARD RATING CODE (For detailed discussion, see Section 9.)

1 NONE: (a) No harm under any conditions; (b) Harmful only under unusual conditions or overwhelming dosage.

2 MIGHT: Causes readily reversible changes which disappear after end of exposure.

3 MODERATE: May involve both irreversible and revers-

ible changes not severe enough to cause death or permanent injury.

3 HIGH: May cause death or permanent injury after very short exposure to small quantities.

U UNKNOWN: No information on humans considered valid by authors.

Explosion Hazard: Unknown.

Countermeasures

Ventilation Control: Section 2.

Personnel Protection: Section 2.

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Recognized by CG, DOT, IATA.

COAL TAR DYES

Hazard Analysis

Toxicity: Many of the coal tar dyes are quite harmless and are permitted for foods, drugs and cosmetics. Some of them may be allergens (Section 9) or carcinogens (Section 8).

COAL TAR GREASE

A recognized carcinogen (Section 8). See coal tar and pitch.

COAL TAR LIGHT OIL

General Information

Lel = 1.3%, uel = 8%, d: < 1, flash point: 60–77°F.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Allergen 1; Ingestion 1; Inhalation 1.

Acute Systemic: Inhalation 1.

A recognized carcinogen (Section 8). See coal tar and pitch.

Fire Hazard: Dangerous, when exposed to heat or flame.
Explosion Hazard: Moderate, when exposed to heat or flame.

Disaster Hazard: Dangerous; when heated to decomposition, it emits highly toxic fumes; can react vigorously with oxidizing materials.

Countermeasures

Ventilation Control: Section 2.

To Fight Fire: Foam, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

Personal Hygiene: Section 2.

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

COAL TAR NAPHTHA. See naphtha, coal tar.

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

COAL TAR NAPHTHALENES

A recognized carcinogen (Section 8). See coal tar and pitch.

COAL TAR OIL. See coal tar light oil.

COAL TAR PITCH *

General Information

A black to brown tarry mass.

Flash p.: 405°F (C.C.), d: > 1.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 1; Allergen 2; Inhalation 1.

Acute Systemic: U.

A recognized carcinogen (Section 8). See coal tar and pitch.

Fire Hazard: Slight, when exposed to heat.

Disaster Hazard: Dangerous; when heated to decomposition, it emits toxic fumes.

Countermeasures

Ventilation Control: Section 2.

To Fight Fire: Water, foam, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

Personal Hygiene: Section 2.

Storage and Handling: Section 7.

COAL TAR RESINS. See coumarone-indene resins.

* This material has been assigned a Threshold Limit Value by ACGIH. See complete reprint of TLV's in Section 1.

COATING SOLUTION

Countermeasures

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

COBALAMIN. See vitamin B₁₂.

COBALT *

General Information

Silver-gray metal.

Formula: Co.

At wt: 58.9, mp: 1495°C, bp: 2900°C, d: 8.9.

Hazard Analysis

Toxicity: See cobalt compounds.

Radiation Hazard: For permissible levels see Section 5, Table 5. Artificial isotope ⁶⁰Co, T_{1/2} = 270d, decays to stable ⁶⁰Fe via ec, emits γ's of 0.01, 0.12 MeV and x-rays. Artificial isotope ⁵⁷Co, T_{1/2} = 9.0h, decays to ⁵⁷Fe via γ's of 0.025 MeV. Artificial isotope ⁵⁸Co, T_{1/2} = 71d, decays to stable ⁵⁸Fe via positrons (15%) of 0.47 MeV. Also decays via ec and emits γ's of 0.81 MeV. Artificial isotope ⁶⁰Co, T_{1/2} = 5.0y, decays to stable ⁶⁰Ni via β's of 0.32 MeV and γ's of 1.17, 1.33 MeV.

Caution: ⁶⁰Co is more likely to be an external hazard than an internal one since most ⁶⁰Co is used as a source of γ's in the form of massive pieces.

Fire Hazard: Moderate, when exposed to heat or flame or by spontaneous chemical reaction. See also powdered metals (Section 7).

COBALT 60. See cobalt.

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

COBALT ACETATE

General Information

Synonym: cobaltous acetate.

Monoclinic, red-violet, deliquescent crystals.

Formula: Co(C₂H₃O₂)₂ · 4H₂O.

Mol wt: 249.09, mp: -4H₂O at 140°C, d: 1.705.

Hazard Analysis and Countermeasures

A trace mineral added to animal feeds (Section 10).

See cobalt compounds.

COBALT ALLOYS

Suspected carcinogens (Section 8). See cobalt compounds.

COBALT ALUMINATE

General Information

Cubic blue crystals.

Formula: CoAl₂O₄.

Mol wt: 176.88.

Hazard Analysis and Countermeasures

See cobalt compounds and aluminum compounds.

COBALT ARSENIC SULFIDE

General Information

Synonym: cobaltite.

Gray-reddish crystals.

Formula: CoAsS.

Mol wt: 165.92, mp: decomposes, d: 6.2–6.3.

Hazard Analysis

Toxicity: Highly toxic. A recognized carcinogen (Section 8). See arsenic compounds and sulfides.

Fire Hazard: See sulfides and arsine.

Explosion Hazard: See sulfides and arsine.

Disaster Hazard: Dangerous; when heated to decomposition, it emits highly toxic fumes of arsine and oxides of sulfur; it will react with water, steam, acid or acid fumes to produce toxic and flammable vapors of arsine and hydrogen sulfide.

Note: For an in-depth discussion of storage and handling and control of fires see Section 7.

Countermeasures

Storage and Handling: Section 7.

COBALT BROMOPLATINATE

General Information

Crystals.

Formula: CoPtBr₆ · 12H₂O.

Mol wt: 949.86, d: 2.762.

Hazard Analysis and Countermeasures: See cobalt compounds, bromides.

COBALT CARBONYL

General Information

Synonyms: cobalt tricarbonylhydride, cobalt carbonyl.

Black crystals.

Formula: (Co(CO)₃)₂ or Co₂(CO)₈.

Mol wt: 571.88.

Hazard Analysis

Toxicity: Highly toxic. See carbonyls and cobalt compounds.

Fire Hazard: See carbonyls and cobalt compounds.

Explosion Hazard: See carbonyls and cobalt compounds.

Disaster Hazard: Dangerous; see carbonyls and cobalt compounds.

Countermeasures

Storage and Handling: Section 7.

COBALT CHLORIDE

General Information

Blue powder.

Formula: CoCl₂.

Mol wt: 129.86, mp: 724°C, bp:

Hazard Analysis and Countermeasures

A trace mineral added to animal feeds (Section 10).

See cobalt compounds and chlorides.

COBALT CHLOROPLATINATE

General Information

Crystals.

Formula: CoPtCl₆ · 6H₂O.

Mol wt: 575.01, mp: decompose

Hazard Analysis and Countermeasures

See cobalt compounds, platinum compounds.

See cobalt compounds, platinum compounds.

See cobalt compounds, platinum compounds.

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See cobalt compounds, platinum compounds.

See cobalt compounds, platinum compounds.

See cobalt compounds, platinum compounds.

Acute Systemic: Ingestion 3; Inhalation 3.
Chronic Local: U.
Chronic Systemic: Ingestion 3; Inhalation 3.
See also cyanides.

Disaster Hazard: Dangerous; when heated to decomposition or on contact with acid or acid fumes, it emits highly toxic fumes.

Countermeasures
Ventilation Control: Section 2.
Personal Hygiene: Section 2.
Storage and Handling: Section 7.

CYANAMIDE

General Information

Synonyms: carbodiimide; cyanogenamide.

Deliquescent crystals.

Formula: HNCNH.

Mol wt: 42.05, mp: 45°C, bp: 260°C, flash p.: 285°F, d: 1.82, vap. d.: 1.45.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: U.

Acute Systemic: Ingestion 2; Inhalation 2.

Chronic Local: U.

Chronic Systemic: Ingestion 1; Inhalation 1.

Toxicology: Does not contain free cyanide. Causes increase in respiration and pulse rate, lowered blood pressure and dizziness. There may be a flushed appearance of the face. Oral LD₅₀ (rat) = 125 mg/kg.

Fire Hazard: Slight, when exposed to heat or flame.

Disaster Hazard: Moderately dangerous; when heated to decomposition or on contact with acid or acid fumes, it emits toxic fumes.

Countermeasures

Ventilation Control: Section 2.

To Fight Fire: Carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

Personal Hygiene: Section 2.

Storage and Handling: Section 7.

CYANATES

Hazard Analysis

Toxicity: Variable. See individual entry.

Disaster Hazard: Dangerous; when heated to decomposition or on contact with acid or acid fumes, they emit toxic fumes.

Countermeasures

Storage and Handling: Section 7.

CYANIC ACID

General Information

Synonym: isocyanic acid.

A liquid. Very acrid odor.

Formula: HOCN.

Mol wt: 43.01, bp: 23.3°C, mp: -86°C, d: 1.140 at 0° 0°C.

Hazard Analysis

Toxicity: Highly toxic. See cyanides. Very irritant.

Explosion Hazard: Severe.

Disaster Hazard: Dangerous; can explode; when heated to decomposition or on contact with acid or acid fumes, it emits highly toxic fumes and flammable vapors.

Countermeasures

Storage and Handling: Section 7.

CYANIDE OF CALCIUM OR CYANIDE OF

CALCIUM, MIXTURE, SOLID. See calcium cyanide.

CYANIDE OF POTASSIUM. See potassium cyanide.

CYANIDE OF SODIUM. See sodium cyanide.

CYANIDE SOLUTIONS, NOS

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

CYANIDES *

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 1.

Acute Systemic: Ingestion 3; Inhalation 3; Skin Absorption 3.

Chronic Local: Irritant 2.

Chronic Systemic: Ingestion 1; Inhalation 1.

Toxicology: The volatile cyanides resemble hydrocyanic acid physiologically, inhibiting tissue oxidation and causing death through asphyxia. Cyanogen is probably as toxic as hydrocyanic acid; the nitriles are generally considered somewhat less toxic, probably because of their lower volatility. The non-volatile cyanide salts appear to be relatively nontoxic systemically, so long as they are not ingested and care is taken to prevent the formation of hydrocyanic acid. Workers, such as electroplaters and picklers, who are daily exposed to cyanide solutions may develop a "cyanide" rash, characterized by itching, and by macular, papular, and vesicular eruptions. Frequently there is secondary infection. Exposure to small amounts of cyanide compounds over long periods of time is reported to cause loss of appetite, headache, weakness, nausea, dizziness, and symptoms of irritation of the upper respiratory tract and eyes. See also specific compounds.

Fire Hazard: Moderate, by chemical reaction with heat, moisture, acid; emit hydrocyanic acid (Section 7).

Caution: Many cyanides evolve hydrocyanic acid rather easily. This is a flammable gas and is highly toxic. Carbon dioxide from the air is sufficiently acidic to liberate hydrocyanic acid from cyanide solutions. See also hydrocyanic acid.

Explosion Hazard: See hydrocyanic acid.

Disaster Hazard: Dangerous; on contact with acid, acid fumes, water or steam, they will produce toxic and flammable vapors.

Countermeasures

Ventilation Control: Section 2.

Personal Hygiene: Section 2.

Storage and Handling: Section 7.

CYANIDES OF COPPER, ZINC, LEAD AND SILVER

Shipping Regulations: Section 11.

Regulated by CG, DOT.

CYANIDES OR CYANIDE MIXTURES, DRY

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

CYANOACETAMIDE

General Information

Synonyms: nitrilomalonamide; propionamide nitrile.

White powder.

Formula: CNCH₂CONH₂.

Mol wt: 84.08, mp: 119°C, bp: decomposes.

TOXIC HAZARD RATING CODE (For detailed discussion, see Section 9.)

○ NONE: (a) No harm under any conditions; (b) Harmful only under unusual conditions or overwhelming dosage.

△ MIGHT: Causes readily reversible changes which disappear after end of exposure.

⊕ MODERATE: May involve both irreversible and revers-

ible changes not severe enough to cause death or permanent injury.

3 HIGH: May cause death or permanent injury after very short exposure to small quantities.

U UNKNOWN: No information on humans considered valid by authors.

Toxicity: See boron compounds.

m-ANISYL BORIC ACID

General Information

Synonym: *m*-methoxy phenyl boric acid.

White crystals.

Formula: $\text{CH}_3\text{OC}_6\text{H}_4\text{B}(\text{OH})_2$.

Mol wt: 152.0.

Hazard Analysis

Toxicity: See boron compounds.

p-ANISYL BORIC ACID

General Information

Synonym: *p*-methoxy phenyl boric acid.

White crystals.

Formula: $\text{CH}_3\text{OC}_6\text{H}_4\text{B}(\text{OH})_2$.

Mol wt: 152.0.

Hazard Analysis

Toxicity: See boron compounds.

p-ANISYL CHLORIDE. See anisoyl chloride.

ANNUANCE TO INDIVIDUALS FROM NOISE.

See Section 3.

ANNUANCE TO COMMUNITY FROM NOISE.

See Section 3.

ANNUUM. A suspected carcinogen. See plant and fungal products (Section 8).

ANOGON. See mercury compounds and iodine.

ANSOL M. See alcohol, denatured.

ANTHION. See potassium persulfate.

ANTHANTHRENE

Hazard Analysis

A polycyclic HC found in air pollution studies.

ANTHRACENE

General Information

Synonyms: *p*-naphthalene; green oil; anthracene oil.

Yellow crystals with blue fluorescence.

Formula: $\text{C}_{14}(\text{CH})_2\text{C}_6\text{H}_4$.

Mol wt: 178.22, mp: 217°C, bp: 345°C, $\text{Iel} = 0.6\%$, flash p.: 250°F (C.C.), d: 1.25 at 27°/4°C, autoign. temp.: 881°F, vap. press.: 1 mm at 145.0°C (sublimes), vap. d.: 6.15.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 1; Allergen 1; Ingestion 1.

Acute Systemic: U.

Chronic Local: Irritant 3; Allergen 1.

Chronic Systemic: Irritant 3; Inhalation 3; Ingestion 3.

Caution: It is a recognized carcinogen of the skin, hands, forearms and scrotum and an experimental carcinogen of the bladder (Section 8).

Fire Hazard: Moderate, when exposed to heat or flame; reacts with oxidizing materials.

Spontaneous Heating: No.

Explosion Hazard: Moderate, when exposed to flame.

Countermeasures

Personal Hygiene: Section 2.

Fire: Fight Fire: Water, foam, carbon dioxide, water spray or mist, dry chemical or carbon tetrachloride (Section 7).

Storage and Handling: Section 7.

ANTHRACENE OIL. See anthracene.

ANTHRACITE PARTICLES *

General Information

Synonym: coal dust.

Black powder or dust.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Inhalation 1.

Acute Systemic: 0.

Chronic Local: Inhalation 2.

Chronic Systemic: 0.

Fire Hazard: Moderate, when exposed to heat or flame, or by chemical reaction with oxidizers (Section 7).

Explosion Hazard: Slight, when exposed to flame (Section 7).

Countermeasures

Ventilation Control: Section 2.

ANTHRALIN

General Information

Synonym: 1,8-dihydroxy anthranol.

Yellow, crystals, insol. in water, sol. in chloroform, acetone and benzene.

Formula: $\text{C}_{14}\text{H}_{10}\text{O}_2$.

Mol wt: 226.2, mp: 176–181°C.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2.

Acute Systemic: Ingestion 2, Inhalation 2; Skin Absorption 2.

Chronic Local: Irritant 2.

Chronic Systemic: Ingestion 2, Inhalation 2, Skin Absorption 2.

Toxicology: Locally it can cause folliculitis of skin. Absorption may result in kidney injury and intestinal disturbances.

Fire Hazard: Slight; when heated.

Countermeasures

Personal Hygiene: Section 2.

Storage and Handling: Section 7.

ANTHRANILIC ACID

General Information

Synonym: *o*-amino benzoic acid.

Needle-like crystals.

Formula: $\text{C}_6\text{H}_4(\text{NH}_2)\text{COOH}$.

Mol wt: 137.1, mp: 146°C, bp: subl., d: 1.412 at 20°C.

Hazard Analysis

Toxicity: Unknown. See *p*-aminobenzoic acid.

Fire Hazard: Slight.

Countermeasures

Storage and Handling: Section 7.

ANTHRAQUINONE

General Information

Yellow crystals.

Formula: $\text{C}_{14}(\text{CO})_2\text{C}_6\text{H}_2$.

Mol wt: 208.20, mp: 286°C, bp: 376.9°C, flash p.: 365°F (C.C.), d: 1.438, vap. press.: 1 mm at 190.0°C, vap. d.: 7.16.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 1; Allergen 1; Ingestion 1.

Acute Systemic: U.

Chronic Local: Allergen 1.

Chronic Systemic: U.

TOXIC HAZARD RATING CODE (For detailed discussion, see Section 9.)

1 NONE: (a) No harm under any conditions; (b) Harmful only under unusual conditions or overwhelming dosage.

2 SLIGHT: Causes readily reversible changes which disappear after end of exposure.

3 MODERATE: May involve both irreversible and revers-

ible changes not severe enough to cause death or permanent injury.

3 HIGH: May cause death or permanent injury after very short exposure to small quantities.

U UNKNOWN: No information on humans considered valid by authors.

NABAM

General Information

Synonym: disodium ethylene bis(dithiocarbamate).

Crystals; sol. in water.

Formula: $C_4H_4N_2Na_2S_4$.

Mol wt: 256.4.

Hazard Analysis

Toxicity: Irritant to skin and mucous membranes. Narcotic in high concentrations. In presence of alcohol can cause violent vomiting. Acute oral LD_{50} (rat) = 395 mk/kg. It is a recognized carcinogen (Section 8). See also carbamates.

Disaster Hazard: Dangerous; when heated to decomposition, it emits highly toxic fumes.

NACMA. See sodium carboxymethylcellulose.

NaK

General Information

Liquid or solid, low melting metallic alloy.

Hazard Analysis

Toxicity: See sodium and potassium.

Toxicology: NaK as its name implies is a low-melting alloy of Na and K. Its toxicity is that of either Na or K alone. In contact with moisture this material reacts very violently to evolve hydrogen and much heat, leaving behind a highly caustic residue of NaOH or KOH. Of course the heat would damage tissue as would the caustic residue. Even fine particles of NaK would damage the eyes, irritate the lungs, etc. Finally when NaK burns it evolves quantities of finely divided fumes of Na_2O , K_2O which is a powerful caustic.

Fire Hazard: Dangerous. In the presence of O_2 , moisture, halogens, oxidizers, acids or acid fumes, etc., it will react violently giving off much heat, often either spattering red hot particles or acutely flaming.

Explosion Hazard: Severe. It will react explosively under many conditions such as contact with moisture, halogens, acid solutions, mists and fumes, powerful oxidizing agents and many organic compounds, containing O_2 or halogen.

Disaster Hazard: Dangerous; when heated, emits highly toxic fumes of sodium and potassium oxides; it will react explosively with water, steam, acid, acid fumes or mists to produce heat, hydrogen, toxic and corrosive fumes; can react vigorously with oxidizing materials. See also sodium and potassium.

Countermeasures

Ventilation Control: Section 2.

To Fight Fire: G-1 powder, dry sodium chloride or dry soda ash. Never use water, foam or carbon tetrachloride (Section 7).

Storage and Handling: Store in a cool place, preferably under kerosene (Section 7).

NALED. See dimethyl-1,2-dibromo-2,2-dichloroethyl phosphate.

NANTOKITE. See cuprous chloride.

* This material has been assigned a Threshold Limit Value by ACGIH. See complete reprint of TLV's in Section 1.

NAPHTHACENE. See tetracene.

NAPHTHA (COAL-TAR) *

General Information

Synonyms: hi-flash naphtha; 160° benzol; naphtha solvent.

Dark, straw-colored to colorless liquid.

Composition: benzene, toluene, xylene, etc.

Bp: 149–216°C, flash p.: 100°F (C.C.), d: 0.862–0.892, autoign. temp.: 900–950°F.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2.

Acute Systemic: Ingestion 3; Inhalation 3; Skin Absorption 3.

Chronic Local: Irritant 1.

Chronic Systemic: Ingestion 3; Inhalation 3; Skin Absorption 3.

Toxicity: Note: A common air contaminant. A recognized carcinogen (Section 8). See oils, mineral.

Fire Hazard: Moderate, when exposed to heat or flame; can react with oxidizing materials. Keep containers tightly closed.

Explosion Hazard: Slight.

Countermeasures

Ventilation Control: Section 2.

To Fight Fire: Foam, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

Personnel Protection: Section 2.

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

NAPHTHA DISTILLATE

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

NAPHTHALENE *

General Information

Synonyms: moth flakes; white tar; tar campher.

Aromatic odor; white, crystalline, volatile flakes.

Formula: $C_{10}H_8$.

Mol wt: 128.16, mp: 80.1°C, bp: 217.9°C, flash p.: 190°F (C.C.), d: 1.162, l_{el} = 0.9%, l_{ul} = 0.6%, autoign. temp.: 1053°F, vap. press.: 1 mm at 123°C, vap. d: 4.42.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2.

Acute Systemic: Ingestion 2; Inhalation 2; Skin Absorption 2.

Chronic Local: Irritant 1.

Chronic Systemic: Ingestion 2; Inhalation 1; Skin Absorption 2.

Toxicity: Note: May be used as an insecticide. Systemic reactions include nausea, headache, diarrhea, hematuria, fever, anemia, liver damage, convulsions and coma.

Fire Hazard: Moderate, when exposed to heat or flame, reacts with oxidizing materials.

Spontaneous Heating: No.

Note: For an in-depth discussion of storage and handling and control of fires see Section 7.

Explosion Hazard: exposed to heat

Countermeasures

Ventilation Control

To Fight Fire: Wa

carbon tetrachl.

Personnel Protectio

Storage and Handli

Shipping Regulation

Regulated by IATA

NAPHTHALENE

General Information

Synonym: naphthyl

White odorless cryst

Formula: $C_{10}H_8$

Mol wt: 186.2, mp: 1

Hazard Analysis

Toxic Hazard Rating

Acute Local: Irrit

Acute Systemic: 1

Chronic Local: U

Chronic Systemic:

Toxicology: Skin ir

pression.

B-NAPHTHALENE

nized carcinoge

1,8-NAPHTHALENE

General Information

Synonym: 1,8-diamin

Crystals. Turn bro

soluble.

Formula: $C_{10}H_8N_2$

Mol wt: 158.2, mp: 6

Hazard Analysis and

See amines.

1,5-NAPHTHALENE

General Information

Synonym: desmodur.

Formula: $C_{10}H_8(NCO)$

Mol wt: 210.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Allerg

Acute Systemic: U

Chronic Local: All

Chronic Systemic:

Toxicity: See also 2,4-

1,3-NAPHTHALENE

General Information

Crystals.

Formula: $C_{10}H_8(SO_2H)$

Mol wt: 288.3.

Hazard Analysis

Toxicity: Details un

Disaster Hazard: Dan

sition, it emits hig

Countermeasures

Storage and Handling:

NAPHTHALENE ET

NONE: (a) No harm

only under unusual c

SLIGHT: Causes re

appear after end of ex

MODERATE: May i

→ Explosion Hazard: Moderate, in the form of dust, when exposed to heat or flame.

Countermeasures

Ventilation Control: Section 2.

To Fight Fire: Water, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

Personnel Protection: Section 2.

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by IATA.

p-NAPHTHALENE. See anthracene.

α -NAPHTHALENE ACETIC ACID

General Information

Synonym: naphthyl acetic acid; planofix.

White odorless crystals; only slightly water soluble.

Formula: $C_{10}H_7CH_2COOH$.

Mol wt: 186.2, mp: 134°C.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2.

Acute Systemic: Ingestion 2; Inhalation 2.

Chronic Local: U.

Chronic Systemic: U.

Toxicology: Skin irritant. Large doses cause CNS depression.

β -NAPHTHALENE AZO- β -NAPHTHOL. A recognized carcinogen (Section 8). See aromatic amines.

1,3-NAPHTHALENE DIAMINE

General Information

Synonym: 1,8-diaminonaphthalene.

Crystals. Turn brown upon standing. Slightly water soluble.

Formula: $C_{10}H_8N_2$.

Mol wt: 158.2, mp: 66.5°C, bp: 205°C, at 12 mm.

Hazard Analysis and Countermeasures

See amines.

1,5-NAPHTHALENE DIISOCYANATE

General Information

Synonym: desmodur.

Formula: $C_{10}H_6(NCO)_2$.

Mol wt: 210.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Allergen 3.

Acute Systemic: U.

Chronic Local: Allergen 3.

Chronic Systemic: U.

Toxicity: See also 2,4-toluylene diisocyanate.

1,3-NAPHTHALENEDIOL. See naphthoresorcinol.

NAPHTHALENE-1,5-DISULFONIC ACID

General Information

Crystals.

Formula: $C_{10}H_6(SO_3H)_2$.

Mol wt: 288.3.

Hazard Analysis

Toxicity: Details unknown. See also naphthalene.

Disaster Hazard: Dangerous; when heated to decomposition, it emits highly toxic fumes of SO_2 .

Countermeasures

Storage and Handling: Section 7.

NAPHTHALENE ETHYLNE. See acenaphthene.

NAPHTHA (PETROLEUM). See petroleum spirits.

NAPHTHA, SAFETY SOLVENT. See stoddard solvent.

NAPHTHA, SOLVENT. See naphtha (coal-tar).

NAPHTHA, V.M.&P.

General Information

Synonyms: benzine; 76° naphtha.

Volatile liquid.

Bp: 100–140°C, flash p.: 20°F (C.C.), d: 0.67–0.80, lel = 0.9%, at 212°F, uel = 6.0% at 212°F, autoign. temp.: 450°F.

Hazard Analysis

Toxicity: See petroleum spirits.

Fire Hazard: Dangerous, when exposed to heat or flame.

Explosion Hazard: Moderate, when exposed to flame.

Disaster Hazard: Dangerous, upon exposure to heat or flame; can react vigorously with oxidizing materials.

Countermeasures

Ventilation Control: Section 2.

To Fight Fire: Foam, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

Storage and Handling: Section 7.

NAPHTHA V.M.&P. 50° FLASH

General Information

Insol. in water.

Constants: Flash p.: 50°F,* autoign. temp.: 450°F,* lel = 0.9%, uel = 6.7%, d: < 1, vap. d.: 4.1, bp: 115–143°C.

*Note: Flash p.: and autoign. temp.: will vary depending on the manufacture.

Hazard Analysis and Countermeasures

See naphtha V.M.&P.

NAPHTHA V.M.&P., HIGH FLASH

General Information

Insol. in water.

Flash p.: 85°F,* autoign. temp.: 450°F,* lel = 1.0%, uel = 6.0%, d: < 1, vap. d.: 4.3, bp: 138–165°C.

*Note: Flash p.: and autoign. temp.: will vary depending on the manufacturer.

Hazard Analysis and Countermeasures

See naphtha, V.M.&P.

NAPHTHENATES. See driers, paint, varnish, enamel, etc.

NAPHTHENE. See cyclohexane.

NAPHTHENIC ACID

General Information

Synonym: hexahydrobenzoic acid.

Odorless crystals; slightly water soluble.

Formula: $C_7H_{12}O_2$.

Mol wt: 128.2, d: 1.034, mp: 31°C, bp: 233°C.

Hazard Analysis

Toxicity: Details unknown. See related compound cyclopentane.

NAPHTHOIC ACID

General Information

Synonym: naphthylene-carboxylic acid.

Two forms: α and β . (1) α : Needles, slightly sol. in hot water; sol. in hot alcohol and ether. (2) β : Plates or needles; slightly sol. in hot water; sol. in alcohol and ether.

TOXIC HAZARD RATING CODE (For detailed discussion, see Section 9.)

0 NONE: (a) No harm under any conditions; (b) Harmful only under unusual conditions or overwhelming dosage.

1 SLIGHT: Causes readily reversible changes which disappear after end of exposure.

2 MODERATE: May involve both irreversible and revers-

ible changes not severe enough to cause death or permanent injury.

3 HIGH: May cause death or permanent injury after very short exposure to small quantities.

U UNKNOWN: No information on humans considered valid by authors.

Mol wt: 441.
Hazard Analysis
 Toxicity: U. A food additive permitted in food for human consumption (Section 10).

PTOMAINES Hazard Analysis

Toxic Hazard Rating:
 Acute Local: U.
 Acute Systemic: Ingestion 3.
 Chronic Local: U.
 Chronic Systemic: U.

Toxicology: These are exceedingly toxic compounds commonly formed in putrefying proteins, dead bodies, decayed meat and fish. They have been prepared synthetically and are derivatives of ethers of the polyhydric alcohols. "Ptomaine poisoning" is usually a misnomer for other forms of food poisoning.

PUBLIC HEALTH HAZARDS FROM SOLID WASTES. See Section 6.

PULSATILLA POWDER Hazard Analysis

Toxic Hazard Rating:
 Acute Local: Irritant 1.
 Acute Systemic: U.
 Chronic Local: U.
 Chronic Systemic: U.

Fire Hazard: Moderate, when exposed to heat or flame; can react with oxidizing materials (Section 7).
 Explosion Hazard: Slight, when exposed to flame.

Countermeasures
 Ventilation Control: Section 2.
 Personal Hygiene: Section 2.
 Storage and Handling: Section 7.

PURPLE FOXGLOVE. See digitalis.

PURPUREO. See chloropentammine cobalt (III) chloride.

PVP. See polyvinylpyrrolidone.

PYRAZOTHION. See *o,o*-diethyl-*o*-(3-methyl-5-pyrazolyl) phosphorothioate.

PYRAZOXON. See *o,o*-diethyl *o*-(3-methyl-5-pyrazolyl) phosphate.

PYRENE

General Information
 Synonym: benzo [d e f] phenanthrene.
 Colorless solid; solutions have a slight blue color; insol. in water; fairly sol. in organic solvents.
 Formula: $C_{20}H_{12}$ (a condensed ring hydrocarbon).
 Mol wt: 202.24, mp: 156°C, d: 1.271 at 23°C, bp: 404°C.
Hazard Analysis
 Toxicology: A recognized carcinogen.

PYRETHRIN I

General Information
 Synonym: pyrethrolone ester of chrysanthemum monocarboxylic acid.
 Viscous liquid.
 Formula: $C_{21}H_{28}O_5$.
 Mol wt: 328.4, bp: 170°C at 0.1 mm decomp.
Hazard Analysis
 Toxic Hazard Rating:

Acute Local: Irritant 2; Allergen 2.
 Acute Systemic: Ingestion 2; Inhalation 3; Allergen 3.

Chronic Local: U.
 Chronic Systemic: Ingestion 2; Inhalation 3.

Toxicology: Has produced diarrhea, convulsions, collapse and respiratory failure, nausea, tinnitus, headache and CNS upset. Oral LD₅₀ (rats) = 1.2 g/kg.

Fire Hazard: Slight (Section 7).

Countermeasures

Ventilation Control: Section 2.
 Personal Hygiene: Section 2.
 Storage and Handling: Section 7.

PYRETHRIN II

General Information

Synonym: pyrethrolone ester of chrysanthemum dicarboxylic acid monomethyl ester.

Viscous liquid.

Formula: $C_{22}H_{28}O_5$.

Mol wt: 372.4, bp: 200°C at 0.1 mm decomp.

Hazard Analysis

Toxicity: See pyrethrin I.

PYRETHRINS. See pyrethrin I and II.

Shipping Regulations: Section 11.

Regulated by IATA.

PYRETHROLONE ESTER OF CHRYSANTHEMUM DICARBOXYLIC ACID MONOMETHYL ESTER. See pyrethrin II.

PYRETHROLONE ESTER OF CHRYSANTHEMUM MONOCARBOXYLIC ACID. See pyrethrin I.

PYRETHROSIN

General Information

Crystals; insol. in water; sol. in hot alcohol, chloroform; slightly sol. in ether of petroleum ether.

Formula: $C_{17}H_{22}O_5$.

Mol wt: 306.4, mp: 199°C.

Hazard Analysis

See pyrethrin I.

PYRETHRUM FLOWERS *

General Information

Synonym: dalmatian insect powder.

Fine powder.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2; Allergen 2.

Acute Systemic: Ingestion 2; Inhalation 2.

Chronic Local: Irritant 2; Allergen 2.

Chronic Systemic: Ingestion 2; Inhalation 2.

Toxicology: Can cause dermatitis of both allergic and contact types. See also pyrethrin I. Large doses can cause hyper-excitability, incoordination, tremors and muscular paralysis.

PYRIDINE *

General Information

Colorless liquid; sharp, penetrating, empyreumatic odor; burning taste.

Formula: $NCH_2CHCH_2CH_2CH_3$.

Mol wt: 79.10, bp: 115.3°C, l_{el} = 1.8% u_{el} = 12.4%,
 fp: -42°C, flash p.: 68°F (C.C.), d: 0.982, autoign. temp.: 900°F, vap. press.: 10 mm at 13.2°C, vap. d.: 2.73.

TOXIC HAZARD RATING CODE (For detailed discussion, see Section 9.)

0 NONE: (a) No harm under any conditions; (b) Harmful only under unusual conditions or overwhelming dosage.

1 SLIGHT: Causes readily reversible changes which disappear after end of exposure.

2 MODERATE: May involve both irreversible and revers-

ible changes not severe enough to cause death or permanent injury.

3 HIGH: May cause death or permanent injury after very short exposure to small quantities.

U UNKNOWN: No information on humans considered valid by authors.

General Information

Synonym: mandelonitrile.

Yellow viscous liquid.

Formula: $C_6H_5CH(OH)CN$.

Mol wt: 133.14, mp: $-10^{\circ}C$, bp: $170^{\circ}C$ decomposes, d: 1.124.

Hazard Analysis

Toxicity: Details unknown, but probably highly toxic.

See also cyanides and nitriles.

Disaster Hazard: See cyanides.

Countermeasures

Storage and Handling: Section 7.

BENZALKONIUM CHLORIDE**General Information**

Synonym: zephiran chloride.

White or yellowish-white powder. Aromatic odor. Very bitter taste.

Formula: alkyl dimethyl benzylammonium chlorides.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 1; Ingestion 2.

Acute Systemic: Ingestion 2.

Chronic Local: Irritant 1.

Chronic Systemic: U.

A bactericide and fungicide. Oral LD_{50} (frogs) = 30 mg/kg.

Disaster Hazard: Dangerous. See chlorides.

BENZALMALONONITRILE**General Information**

Crystals.

Formula: $C_6H_5CH_2CH(CN)_2$.

Mol wt: 156.2.

Hazard Analysis

Toxicity: Highly toxic, see cyanides.

Disaster Hazard: See cyanides.

Countermeasures

Storage and Handling: Section 7.

BENZANTHRONE**General Information**

Pale yellow needles.

Formula: $C_{17}H_{10}O$.

Mol wt: 230.25, mp: $174^{\circ}C$, vap. press.: 1 mm at $225.0^{\circ}C$.

Hazard Analysis

Toxicity: Unknown.

Fire Hazard: Slight; when heated (Section 7).

Countermeasures

Storage and Handling: Section 7.

2-BENZAZINE. See isoquinoline.

3,4-BENZCHRYSENE. See picene.

"BENZEDRINE"**General Information**

Synonym: amphetamine.

Liquid.

Formula: $C_9H_{11}N$.

Mol wt: 135.20, bp: $200^{\circ}C$, flash p.: $80^{\circ}F$ (O.C.), d: 0.931, vap. d.: 4.65.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: 0.

Acute Systemic: Ingestion 2; Inhalation 2.

Chronic Local: 0.

Chronic Systemic: Ingestion 1; Inhalation 1.

Caution: A Stimulant. Overdoses cause hyperactivity, restlessness, insomnia, rapid pulse, rise in blood pressure, dilated pupils, dryness of the throat.

* This material has been assigned a Threshold Limit Value by ACGIH. See complete reprint of TLV's in Section 1.

Fire Hazard: Dangerous; when exposed to heat or flame; can react with oxidizing materials.

Disaster Hazard: Dangerous, upon exposure to heat or flame.

Countermeasures

Ventilation Control: Section 2.

Personal Hygiene: Section 2.

Treatment and Antidotes: Evacuation of stomach if taken by mouth, sedatives. Call a physician.

To Fight Fire: Carbon dioxide or dry chemical or carbon tetrachloride (Section 7).

Storage and Handling: Section 7.

BENZENE ***General Information**

Synonyms: benzol; phenyl hydride; coal naphtha.

Clear colorless liquid.

Formula: C_6H_6 .

Mol wt: 78.11, mp: $5.51^{\circ}C$, bp: $80.093^{\circ}-80.094^{\circ}C$,

flash p.: $12^{\circ}F$ (C.C.), d: 0.8794 at $20^{\circ}C$, autoign.

temp.: $1044^{\circ}F$, lcl: 1.3%, ucl: 7.1%, vap. press.: 100 mm at $26.1^{\circ}C$, vap. d.: 2.77.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2; Ingestion 1; Inhalation 1.

Acute Systemic: Ingestion 2; Inhalation 2; Skin Absorption 2.

Chronic Local: 0.

Chronic Systemic: Ingestion 3; Inhalation 3; Skin Absorption 3.

Toxicology: Poisoning occurs most commonly through inhalation of the vapor, though benzene can penetrate the skin, and thus contribute to poisoning.

Locally, benzene has a comparatively strong irritating effect producing erythema and burning, and in more severe cases, edema and even blistering (Section 9). Exposure to high concentrations of the vapor (3,000 ppm or higher) results from accidents such as failure of equipment or spillage. Such exposure, while rare in industry, may result in acute poisoning, characterized by the narcotic action of benzene on the central nervous system. The anesthetic action of benzene is similar to that of other anesthetic gases, consisting of a preliminary stage of excitation followed by depression and, if exposure is continued, death through respiratory failure.

The chronic, rather than the acute form of benzene poisoning is important in industry. It is a recognized carcinogen of the blood-forming tissues. There is no specific blood picture occurring in cases of chronic benzol poisoning.

The bone marrow may be hypoplastic, normal, or hyperplastic, the changes being reflected in the peripheral blood. Anemia, leucopenia, macrocytosis, reticulocytosis, thrombocytopenia, high color index, and prolonged bleeding time may be present. Cases of myeloid leukemia have been reported. For the supervision of the worker, repeated blood examinations are necessary, including hemoglobin determinations, white and red cell counts and differential smears. Where a worker shows a progressive drop in either red or white cells, or where the white count remains below 5,000 per cu. mm., or the red count below 4.0 million per cu. mm., on two successive monthly examinations, he should be immediately removed from exposure.

Following absorption of benzene, elimination is chiefly through the lungs, when fresh air is breathed. The portion that is absorbed, is oxidized, and the

Note: For an in-depth discussion of storage and handling and control of fires see Section 7.

oxidation products, glycuronic acids, may be used as definite cumulative high concentrations of view of cing system, provided. On the concentrations of 10% damage if continued.

In acute poisoning and dizzy, complaints and of pressure into a stage of exposure, he quickly into coma. In not complete and no In chronic poisoning symptoms vague: nausea and loss of weakness are common. Later, pallor, nose, petechiae, hemorrhage, petechiae, some of chronic benzene common air contamination. Hazard: Dangerous. Benzene reacts vigorously with strong oxidizing agents. Heating: No. Fire Hazard: Moderate. Use of flame. Use of flame. Hazard: Dangerous. Countermeasures: Ventilation Control: Section 2. Personal Protection: Section 2. Fight Fire: Foam, carbon tetrachloride, A.D. Section 9.

Storage and Handling: Section 7. Regulations: Section 7. Controlled by CG, DOT, etc.

BENZENE ARSONIC ACID

BENZENE CARBONYL CHLORIDE

BENZENDIOL. See 1,2-DIPHENYLETHANEDITHIOL.

BENZENE DIAZOANIL

BENZENE DIAZONIUM CHLORIDE

BENZENE DIAZONIUM CHROMATE

BENZENE DIAZONIUM NITRATE

BENZENE DICARBONATE

BENZENE DICARBOXYLIC ACID

BENZENE DIOL. See 1,2-DIPHENYLETHANEDITHIOL.

BENZENE DIOL. See 1,2-DIPHENYLETHANEDITHIOL.

BENZENE-1,3-DIPHENYL

BENZENE-1,3-DIPHENYL

BENZENE-1,3-DIPHENYL

BENZENE-1,3-DIPHENYL

BENZENE-1,3-DIPHENYL

BENZENE-1,3-DIPHENYL

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BENZENE-1,3-DIPHENYL

BENZENE-1,3-DIPHENYL

BENZENE-1,3-DIPHENYL

BENZENE-1,3-DIPHENYL

oxidation products are combined with sulfuric and glycuronic acids and eliminated in the urine. This may be used as a diagnostic sign. Benzene has a definite cumulative action, and exposure to relatively high concentrations are not serious from the point of view of causing damage to the blood-forming system, provided that the exposure is not repeated. On the other hand, daily exposure to concentrations of 100 ppm or less will usually cause damage if continued over a protracted period of time.

In acute poisoning, the worker becomes confused and dizzy, complains of tightening of the leg muscles and of pressure over the forehead, then passes into a stage of excitement. If allowed to remain in exposure, he quickly becomes stupefied and lapses into coma. In nonfatal cases, recovery is usually complete and no permanent disability occurs.

In chronic poisoning the onset is slow, with the symptoms vague; fatigue, headache, dizziness, nausea and loss of appetite, loss of weight, and weakness are common complaints in early cases. Later, pallor, nosebleeds, bleeding gums, menorrhagia, petechiae and purpura may develop. There is great individual variation in the signs and symptoms of chronic benzene poisoning. Note: Benzene is a common air contaminant.

Fire Hazard: Dangerous; when exposed to heat or flame; can react vigorously with oxidizing materials.

Spontaneous Heating: No.

Explosion Hazard: Moderate, when its vapors are exposed to flame. Use with adequate ventilation.

Disaster Hazard: Dangerous; highly flammable.

Countermeasures

Ventilation Control: Section 2.

Personnel Protection: Section 2.

To Fight Fire: Foam, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

First Aid: Section 9.

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

BENZENE ARSONIC ACID. See phenyl arsonic acid.

BENZENE CARBONYL CHLORIDE. See benzoyl chloride.

1,3-BENZENDIOL. See resorcinol.

BENZENE DIAZOANILIDE. See β -diazoamidobenzol.

BENZENE DIAZONIUM CHLORIDE. See diazobenzene chloride.

BENZENE DIAZONIUM CHROMATE. See diazobenzol chromate.

BENZENE DIAZONIUM NITRATE. See diazobenzene nitrate.

1,3-BENZENE DICARBONITRILE. See *o*-dicyanobenzene.

BENZENE DICARBOXYLIC ACID. See phthalic acid.

1,2-BENZENE DIOL. See pyrocatechol.

1,4-BENZENE DIOL. See hydroquinone.

BENZENE-1,3-DIPHENYL. See *m*-terphenyl.

BENZENE-1,4-DIPHENYL. See *p*-terphenyl.

m-BENZENEDISULFONIC ACID

General Information

Synonym: MBDSA.

Gray crystalline hygroscopic powder.

Formula: $C_6H_4O_6S_2$

Mol wt: 238.23.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 3; **Ingestion 3;** **Inhalation 2.**

Acute Systemic: U.

Chronic Local: Irritant 2.

Chronic Systemic: U.

Caution: In solutions it forms an extremely corrosive liquid.

Disaster Hazard: Dangerous; see sulfonates.

Countermeasures

Personnel Protection: Section 2.

First Aid: Section 9.

Storage and Handling: Section 7.

BENZENE HEXACHLORIDE. See hexachlorocyclohexane.

BENZENE PHOSPHONIC ACID

General Information

Colorless crystals.

Formula: $C_6H_5PO(OH)_2$

Mol wt: 158.1, **mp:** 165°C, **d:** 1.475.

Toxicity: Unknown.

Countermeasures

Storage and Handling: Section 7.

BENZENE PHOSPHORUS DICHLORIDE

General Information

Synonym: phenyl dichlorophosphine.

Colorless liquid.

Formula: $C_6H_5PCl_2$

Mol wt: 179, **mp:** -55°C, **bp:** 224.6°C, **d:** 1.319 at 20°/20°C, **vap. d:** 6.2.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2; **Ingestion 2;** **Inhalation 2.**

Acute Systemic: U.

Chronic Local: U.

Chronic Systemic: U.

Disaster Hazard: See hydrochloric acid.

Countermeasures

Ventilation Control: Section 2.

Personnel Protection: Section 2.

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

BENZENE PHOSPHORUS OXYDICHLORIDE

General Information

Synonym: phenyl dichlorophosphine oxide.

Colorless liquid; faint fruity odor.

Formula: $C_6H_5POCl_2$

Mol wt: 195, **bp:** 258°C, **d:** 1.375 at 20°/20°C, **vap. d:** 6.7.

Hazard Analysis

Toxicity:

Disaster Hazard: See chlorides and phosphates.

Countermeasures

Storage and Handling: Section 7.

TOXIC HAZARD RATING CODE (For detailed discussion, see Section 9.)

0 NONE: (a) No harm under any conditions; (b) Harmful only under unusual conditions or overwhelming dosage.

1 SLIGHT: Causes readily reversible changes which disappear after end of exposure.

2 MODERATE: May involve both irreversible and revers-

ible changes not severe enough to cause death or permanent injury.

3 HIGH: May cause death or permanent injury after very short exposure to small quantities.

U UNKNOWN: No information on humans considered valid by authors.

C-11

Countermeasures

Storage and Handling: Section 7.
Shipping Regulations: Section 11.
Regulated by CG, DOT, IATA.

COTUNNITE. See lead chloride.

CUMAPHOS**General Information**

Synonym: co-ral.

Tan crystalline solid.

Formula: $C_{11}H_{13}O_5PSCl$.

Mol wt: 362.6, mp: 92°C; not sol. in water.

Hazard Analysis

Highly toxic insecticide. Acute oral LD_{50} (rat) = 56–230 mg/kg.

CUMARIN**General Information**

Synonym: 1,2-benzopyrone.

Crystals; fragrant, pleasant odor; burning taste.

Formula: $C_9H_6O_2$.

Mol wt: 146.1, mp: 70°C, bp: 291.0°C, vap. press.: 1 mm at 106.0°C.

Hazard Analysis**Toxic Hazard Rating:**

Acute Local: Allergen 1.

Acute Systemic: Ingestion 1; Inhalation 1.

Chronic Local: Allergen 1.

Chronic Systemic: U.

Toxicology: The parent substance of dicoumarol, which causes disturbances in the clotting mechanism of the blood, and hence can lead to spontaneous bleeding.

Fire Hazard: Slight, when exposed to heat or flame (Section 7).

Countermeasures

Ventilation Control: Section 2.

Personal Hygiene: Section 2.

Storage and Handling: Section 7.

COUMARONE-INDENE RESINS**General Information**

Synonyms: coal tar resins; indene resins; polycoumarone resins; polyindene resins.

Vary from fairly viscous liquids to hard resins; color—pale yellow to nearly black; sol. in hydrocarbon solvents; pyridine, acetone, carbon disulfide, and carbon tetrachloride; insol. in water and alcohol.

Hazard Analysis

Toxic Hazard Rating: U. A food additive permitted in food for human consumption (Section 10).

CRAB-E-RAD. See disodium monomethylarsonate.

CRAG HERBICIDE 974. See 3,5-dimethyltetrahydro-1,3,5-2H-thiadiazine-2-thione.

CRAG I. * See dichlorophenoxyethyl sulfate.

CRAG FRUIT FUNGICIDE 341. See glyodin.

CRAG FUNGICIDE 974. See mylone.

CREAM OF TARTAR. See potassium acid tartrate.

CRESOL**General Information**

Synonym: 2-methoxy-4-methyl phenol; 4-methylguaiacol; 2-methoxy-*p*-cresol.

Colorless to yellow liquid, slightly sol. in water; sol. in alcohol, benzene, chloroform, ether, acetic acid.

Formula: $CH_3O(CH_3)C_6H_4OH$.

Mol wt: 138.16, d: 1.092 (25°/4°C), mp: 5.5°C, bp: 220°C.

Hazard Analysis and Countermeasures

Highly toxic, see phenol.

CREOSOTE, COAL TAR**General Information**

Synonym: creosote oil.

Colorless or yellow clear, oily liquid.

Composition: A mixture of phenols from coal tar.

Bp: 200–250°C, flash p.: 165°F (C.C.), d: 1.07, autoign. temp.: 637°F.

Hazard Analysis**Toxic Hazard Rating:**

Acute Local: Irritant 2; Ingestion 2; Inhalation 2.

Acute Systemic: Ingestion 2; Inhalation 2.

A recognized carcinogen, of skin, forearm, scrotum, face, neck and penis. An experimental carcinogen of the lungs (Section 8).

Fire Hazard: Moderate, when exposed to heat or flame.

Disaster Hazard: Dangerous; when heated to decomposition, it emits toxic fumes.

Countermeasures

Ventilation Control: Section 2.

Personnel Protection: Section 2.

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by IATA.

CREOSOTE (CRESOL AND PHENOL) MIXTURE.

See cresol and phenol.

CREOSOTE OIL. See creosote, coal tar.

CRESOL ***General Information**

Synonyms: cresylic acid, cresylol, tricresol.

Description (U.S.P. XVI) mixture of isomeric cresols obtained from coal tar; colorless or yellowish to brown yellow or pinkish liquid, phenol-like odor.

Formula: $C_6H_4OHCH_3$.

Mol wt: 108.10, mp: 10.9–35.5°C, bp: 191–203°C, flash p.: 178°F, d: 1.030–1.038 at 25°/25°C, vap. press.: 1 mm at 38–53°C, vap. d.: 3.72.

Hazard Analysis**Toxic Hazard Rating:**

Acute Local: Irritant 2; Allergen 1; Ingestion 2; Inhalation 2.

Acute Systemic: Ingestion 2; Inhalation 2; Skin Absorption 2.

Chronic Local: Irritant 3; Allergen 1.

Chronic Systemic: Ingestion 2; Inhalation 2; Skin Absorption 2.

Toxicology: Cresol is similar to phenol in its action on the body, but it is less severe in its effects. It has corrosive action on the skin and mucous membranes. Systemic poisoning has rarely been reported, but it is possible that absorption may result in damage to the kidneys, liver and nervous system. The main hazard accompanying its use in industry lies in its action on the skin and mucous membranes, with production of severe chemical burns and dermatitis (Section 9).

Fire Hazard: Moderate, when exposed to heat or flame.

TOXIC HAZARD RATING CODE (For detailed discussion, see Section 9.)

0 NONE: (a) No harm under any conditions; (b) Harmful only under unusual conditions or overwhelming dosage.

1 SLIGHT: Causes readily reversible changes which disappear after end of exposure.

2 MODERATE: May involve both irreversible and revers-

ible changes not severe enough to cause death or permanent injury.

3 HIGH: May cause death or permanent injury after very short exposure to small quantities.

U UNKNOWN: No information on humans considered valid by authors.

Explosion Hazard: Slight, in the form of vapor when exposed to heat or flame (Section 7).

Explosive Range: 1.35% at 300°F.

Disaster Hazard: Dangerous; when heated to decomposition, it emits highly toxic fumes; it can react vigorously with oxidizing materials.

Countermeasures

Ventilation Control: Section 2.

Personnel Protection: Section 2.

Storage and Handling: Section 7.

To Fight Fire: Foam, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

Shipping Regulations: Section 11.

Regulated by IATA.

m-CRESOL *

General Information

Synonym: *m*-methylphenol.

Colorless to yellowish liquid; phenolic odor.

Formula: C_6H_5O .

Mol wt: 108.1, mp: 10.9°C, bp: 202.8°C, l_{el} = 1.1% at 302°F, flash p.: 202°F, d: 1.034 at 20°/4°C, autoign. temp.: 1038°F, vap. press.: 1 mm at 52.0°C, vap. d.: 3.72.

Hazard Analysis

Toxicity: see cresol.

Fire Hazard: See cresol.

Explosion Hazard: Moderate, in the form of vapor when exposed to heat or flame (Section 7).

Disaster Hazard: See cresol.

Countermeasures

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by IATA.

o-CRESOL *

General Information

Synonyms: *o*-cresylic acid; *o*-hydroxytoluene.

Crystals or liquid darkening with exposure to air and light.

Formula: C_6H_5O .

Mol wt: 108.1, mp: 30.8°C, bp: 190.8°C, flash p.: 178°F, density: 1.047 at 20°/4°C, autoign. temp.: 1110°F, vap. press.: 1 mm at 38.2°C, vap. d.: 3.72, l_{el} = 1.4% at 300°F.

Hazard Analysis

Toxicity: See cresol.

Fire Hazard: See cresol.

Explosion Hazard: See cresol.

Disaster Hazard: See cresol.

Countermeasures

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by IATA.

p-CRESOL *

General Information

Synonym: 4-cresol.

Crystals, phenolic odor.

Formula: C_6H_5O .

Mol wt: 108.1, mp: 35.5°C, bp: 201.8°C, l_{el} = 1.1% at 302°F, flash p.: 202°F, d: 1.0341 at 20°/4°C, autoign. temp.: 1038°F, vap. press.: 1 mm at 53.0°C, vap. d.: 3.72.

Hazard Analysis

Toxicity: See cresol.

Fire Hazard: Moderate, when exposed to heat or flame.

Spontaneous Heating: No.

Explosion Hazard: Moderate, in the form of vapor when exposed to heat or flame (Section 7).

Disaster Hazard: See cresol.

* This material has been assigned a Threshold Limit Value by ACGIH. See complete reprint of TLV's in Section 1.

Countermeasures

Storage and Handling: Section 7.

To Fight Fire: Carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

Shipping Regulations: Section 11.

Regulated by IATA.

4-CRESOL. See *p*-cresol.

CRESOLITE. See 2,4,6-trinitro-*m*-cresol.

CRESOTIC ACID. See *o*-cresotinic acid.

o-CRESOTINIC ACID

General Information

Synonym: cresotic acid; hydroxytoluic acid; homosalicylic acid.

White to yellowish needle-like crystals.

Formula: $C_6H_3(CH_3)(OH)COOH$.

Mol wt: 152.1, mp: 166°C sublimes.

Hazard Analysis

Toxicity: Unknown. See salicylic acid.

Fire Hazard: Slight (Section 7).

Countermeasures

Storage and Handling: Section 7.

CRESYL DIPHENYL PHOSPHATE

General Information

Liquid.

Formula: $(CH_3C_6H_4)(C_6H_5)_2PO_4$.

Mol wt: 403.3, bp: 368°C, flash p.: 450°F, d: 1.208, vap. d.: 11.7.

Toxicity: See tri-*o*-cresyl phosphate.

Fire Hazard: Slight, when exposed to heat or flame.

Disaster Hazard: Dangerous; see phosphates.

Countermeasures

Storage and Handling: Section 7.

To Fight Fire: Water, foam, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

CRESYLIC ACID. See cresol.

o-CRESYLIC ACID. See *o*-cresol.

CRISTOBALITE. See quartz.

CROCIDOLITE

A recognized carcinogen (Section 8). See asbestos.

CROCOITE. See lead chromate.

CROTONALDEHYDE *

General Information

Synonyms: 2-butenal; crotonic aldehyde; β -methylacrolein.

Water-white mobile liquid; pungent suffocating odor.

Formula: $CH_3CHCHCHO$.

Mol wt: 70.09, bp: 104°C, fp: -76.0°C, l_{el} = 2.1%, l_{el} = 15.5%, flash p.: 55°F, d: 0.853 at 20°/20°C, vap. d.: 2.41.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 3; Allergen 2; Ingestion 3; Inhalation 3.

Acute Systemic: U.

Chronic Local: Allergen 2.

Chronic Systemic: U.

Toxicology: A lachrymating material which is very dangerous to the eyes. Can cause corneal burn and is irritating to the skin. Very irritant.

Fire Hazard: Dangerous, when exposed to heat or flame; can react with oxidizing materials.

Spontaneous Heating: No.

Disaster Hazard: Dangerous; keep away from heat and open flame.

Note: For an in-depth discussion of storage and handling and control of fires see Section 7.

Countermeasures

Ventilation Control: S

Treatment and Antid

ately flush the sk

15 minutes. Get m

Personnel Protection:

Storage and Handling:

To Fight Fire: Alcho

ical or carbon tet

Shipping Regulations:

Regulated by CG, DOT

CROTONALIC ACID

CROTONIC ACID

General Information

Synonym: β -methacryl

Colorless needle-like cr

Formula: $CH_3CHCHCO_2H$

Mol wt: 86.09, bp: 18

(C.O.C.), d: 1.018

at 20°C, vap. d: 2.

Hazard Analysis

Toxicity: Unknown. E

toxicity in rats and

Fire Hazard: Slight, w

can react with oxid

Countermeasures

To Fight Fire: Alcohol

ical or carbon tetra

Storage and Handling: S

CROTONIC ACID-2,4-

HEPTYL) PHENY

CROTONIC ALDEHY

CROTONIC ANHYDR

Hazard Analysis

Toxic Hazard Rating:

suggest moderate to

CROTONITRILE

General Information

Synonym: 2-butenitril

Formula: C_4H_5N .

Mol wt: 67, flash p.: <

230-240.8°F.

Hazard Analysis

Toxicity: See nitriles. Pro

Fire Hazard: Moderate,

Disaster Hazard: Dange

Countermeasures

Storage and Handling: Se

CROTON OIL

General Information

Synonym: tigilium oil.

Brownish-yellow, viscid oi

Composition: Croton resi

croton

1935-0.950 at 25°/25°

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2;

Acute Systemic: Ingesti

Chronic Local: Allergen

Chronic Systemic: U.

TO

NONE: (a) No harm un

under unusual condi

LIGHT: Causes readily

after end of expos

MODERATE: May invo

Personnel Protection: Section 2.
Storage and Handling: Section 7.

p-PHENETIDINE**General Information**

Synonym: 4-aminophenetole.

Colorless liquid.

Formula: $C_8H_{11}NO$.

Mol wt: 137.2, mp: 3°C, bp: 254°C, flash p.: 240°F, d: 1.0652 at 16°/4°C, vap. d.: 4.73.

Hazard Analysis**Toxic Hazard Rating:**

Acute Local: U.

Acute Systemic: Ingestion 3; Inhalation 3; Skin Absorption 3.

A recognized carcinogen (Section 8). See aromatic amines.

Fire Hazard: Slight, when exposed to heat or flame.

Disaster Hazard: Dangerous; when heated to decomposition, it emits highly toxic fumes of NO_x ; reacts vigorously with powerful oxidizers.

Countermeasures

Ventilation Control: Section 2.

Personnel Protection: Section 2.

Storage and Handling: Section 7.

PHENETOLE. See phenyl ethyl ether.

PHENIC ACID. See phenol.

PHENIDONE**General Information**

Synonym: 1-phenyl-3-pyrazolidone.

Crystals. Water soluble.

Formula: $C_8H_9N_2O$.

Mol wt: 162.2, mp: 121°C.

Hazard Analysis

Toxicity: Details unknown. Animal experiments show low toxicity and no skin irritation.

Disaster Hazard: Dangerous; when heated to decomposition, it emits highly toxic fumes.

PHENOBARBITAL**General Information**

White, shining, crystalline, odorless powder; bitter taste.

Formula: $CO(NHCO)_2C(C_6H_5)(C_6H_5)$.

Mol wt: 232.2, mp: 174–178°C.

Hazard Analysis**Toxic Hazard Rating:**

Acute Local: U.

Acute Systemic: Ingestion 3.

Chronic Local: U.

Chronic Systemic: Ingestion 2.

Caution: Repeated ingestion may lead to habituation.

Oral LD_{50} (rats) = 660 mg/kg.

Fire Hazard: Slight; when heated to decomposition, it emits toxic fumes (Section 7).

Countermeasures

Ventilation Control: Section 2.

Personal Hygiene: Section 2.

Storage and Handling: Section 7.

PHENOL ***General Information**

Synonyms: carbolic acid; phenic acid; phenylic acid.

White, crystalline mass which turns pink or red if not perfectly pure; burning taste, distinctive odor.

Formula: C_6H_5OH .

Mol wt: 94.11, mp: 40.6°C, bp: 181.9°C, flash p.: 175°F (C.C.), d: 1.072, autoign. temp.: 1319°F, vap. press.: 1 mm at 40.1°C, vap. d.: 3.24.

Hazard Analysis**Toxic Hazard Rating:**

* This material has been assigned a Threshold Limit Value by ACGIH. See complete reprint of TLV's in Section 1.

Acute Local: Irritant 3; Ingestion 3; Inhalation 3.
Acute Systemic: Ingestion 3; Inhalation 3; Skin Absorption 3.

Chronic Local: Irritant 2.

Chronic Systemic: Ingestion 2; Inhalation 2; Skin Absorption 2.

Toxicology: In acute phenol poisoning, the main effect is on the central nervous system. Absorption from spilling phenolic solutions on the skin may be very rapid, and death results from collapse within 30 minutes to several hours. Death has resulted from absorption of phenol through a skin area of 64 square inches. Where death is delayed, damage to the kidneys, liver, pancreas, spleen, and edema of the lungs may result. Absorbed phenol is partly excreted by the kidneys, partly oxidized. Part of the excreted portion is combined with sulfuric and glycuronic acids; the remainder is excreted unchanged. The symptoms develop rapidly, frequently within 15 to 20 minutes following spilling of phenol on the skin. Headache, dizziness, muscular weakness, dimness of vision, ringing in the ears, irregular and rapid breathing, weak pulse, and dyspnea may all develop, and may be followed by loss of consciousness, collapse and death. When taken internally, there is also nausea, with or without vomiting, severe abdominal pain, and corrosion of the lips, mouth, throat, esophagus and stomach. There may be perforation. On the skin, the affected area is white, wrinkled and softened, and there is usually no immediate complaint of pain; later, intense burning is felt, followed by local anesthesia and still later, by gangrene. A cocarcinogen (Section 8). Oral LD_{50} (rats) = 530 mg/kg.

Chronic poisoning, following prolonged exposures to low concentrations of the vapor or mist, results in digestive disturbances (vomiting, difficulty in swallowing, excessive salivation, diarrhea, loss of appetite), nervous disorders (headache, fainting, dizziness, mental disturbances) and skin eruptions. Chronic poisoning may terminate fatally in cases where there has been extensive damage to the kidneys or liver. Dermatitis resulting from contact with phenol or phenol-containing products is fairly common in industry. A common air contaminant. As little as 1.5 g (oral) has killed.

Fire Hazard: Moderate, when exposed to heat or flame. Spontaneous Heating: No.

Disaster Hazard: Dangerous; when heated it emits toxic fumes; can react with oxidizing materials.

Countermeasures

Ventilation Control: Section 2.

To Fight Fire: Alcohol foam, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

Personnel Protection: Section 2.

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

PHENOL LITHIUM. See lithium phenate.

PHENOLPHTHALEIN**General Information**

Synonym: 3,3-bis(p-hydroxyphenyl)phthalide.

Small crystals.

Formula: $C_{20}H_{14}O_4$.

Mol wt: 318.3, mp: 260°C, d: 1.277.

Hazard Analysis**Toxic Hazard Rating:**

Acute Local: U.

Acute Systemic: Ingestion 2.

Note: For an in-depth discussion of storage and handling and control of fires see Section 7.

Chronic Local:
Chronic Systemic:
Countermeasures:
Personal Hygiene:
Storage and Hand

PHENOLS, HIGH**General Information**

Liquid.

Composition: Alk

Mol wt: 150 (av

flash p.: 250

press.: 0.01 m

Hazard Analysis

Toxicity: See phen

Fire Hazard: Slig

can react with

Disaster Hazard: I

fumes.

Countermeasures

To Fight Fire: Fo

carbon tetrach

Storage and Handl

PHENOL SULFO**Hazard Analysis**

Toxic Hazard Rati

Acute Local: Irr

Acute Systemic:

Chronic Local: 1

Chronic Systemic

Disaster Hazard: 1

Countermeasures

Ventilation Control

Personnel Protecti

Storage and Handli

PHENOLSULFON**General Information**

Synonym: sulfocart

Yellowish liquid; a

acids.

Formula: $C_6H_5SO_3$

Mol wt: 174.17, mp

Hazard Analysis

Toxicity: Details ur

than phenol. Se

Disaster Hazard: 1

with water or s

Countermeasures

Storage and Handli

Shipping Regulation

Regulated by IATA

PHENOTHIAZINE**General Information**

Synonym: thiodiphe

ellow crystals.

Formula: $C_{12}H_8NS$

Mol wt: 199.3, mp

Hazard Analysis

Toxic Hazard Rati

Acute Local: Irrit

Acute Systemic: 1

Chronic Local: U

Chronic Systemic:

Toxicology: An ins

NONE: (a) No ha

only under unusua

SLIGHT: Causes

appear after end of

MODERATE: May

gestion 3; Inhalation 3.
3; Inhalation 3; Skin Ab-

2; Inhalation 2; Skin Ab-

poisoning, the main effect
system. Absorption from
on the skin may be very
from collapse within 30

Death has resulted from
ough a skin area of 64
th is delayed, damage to

us, spleen, and edema of
bsorbed phenol is partly
partly oxidized. Part of the

oined with sulfuric acid
mainder is excreted un-
velop rapidly, frequently

ollowing spilling of phenol
izziness, muscular weak-
ng in the ears, irregular

pulse, and dyspnea may
followed by loss of con-
death. When taken in-

ausea, with or without
al pain, and corrosion of
esophagus and stomach.

On the skin, the affected
and softened, and there is
omplaint of pain; later,

owed by local anesthesia
e. Carcinogen (Sec-
303.1 kg.

ollowing prolonged ex-
ons of the vapor or mist,
bances (vomiting, diffi-

isive salivation, diarrhea,
us disorders (headache,
disturbances) and skin.

ng may terminate fatally
een extensive damage to
atitis resulting from con-

ol-containing products is
ry. A common air con-
oral) has killed.

Exposed to heat or flame.
hen heated it emits toxic
ing materials.

Carbon dioxide, dry chem-
(Section 7).

phenate.

yl)phthalide.

age and handling

Chronic Local: U.
Chronic Systemic: U.

Countermeasures

Personal Hygiene: Section 2.

Storage and Handling: Section 7.

PHENOLS, HIGH-BOILING

General Information

Liquid.

Composition: Alkyl-substituted phenols.

Mol wt: 150 (average), bp: 238–288°C, fp: < -40°C,
flash p.: 250°F (O.C.), d: 1.033 at 20°/20°C, vap.
press.: 0.01 mm at 20°C, vap. d.: approx. 5.2.

Hazard Analysis

Toxicity: See phenol.

Fire Hazard: Slight, when exposed to heat or flame;
can react with oxidizing materials.

Disaster Hazard: Dangerous; when heated, it emits toxic
fumes.

Countermeasures

To Fight Fire: Foam, carbon dioxide, dry chemical or
carbon tetrachloride (Section 7).

Storage and Handling: Section 7.

PHENOL SULFONATE

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2.

Acute Systemic: Ingestion 2; Inhalation 2.

Chronic Local: Irritant 1.

Chronic Systemic: Ingestion 2; Inhalation 2.

Disaster Hazard: Dangerous; see sulfonates.

Countermeasures

Ventilation Control: Section 2.

Personnel Protection: Section 2.

Storage and Handling: Section 7.

PHENOLSULFONIC ACID

General Information

Synonym: sulfocarbolic acid.

Yellowish liquid; a mixture of *o*- and *p*-phenolsulfonic
acids.

Formula: $C_6H_5SO_3H$.

Mol wt: 174.17, mp: 50°C, d: 1.155.

Hazard Analysis

Toxicity: Details unknown; less irritating and less toxic
than phenol. See phenol and sulfuric acid.

Disaster Hazard: Dangerous; see sulfonates; will react
with water or steam to produce heat.

Countermeasures

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by IATA.

PHENOTHIAZINE *

General Information

Synonym: thiodiphenylamine.

Yellow crystals.

Formula: $C_{12}H_9NS$.

Mol wt: 199.3, mp: 185.1°C, bp: 371°C decomposes.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2; Ingestion 2.

Acute Systemic: Ingestion 2; Skin Absorption 2.

Chronic Local: U.

Chronic Systemic: U.

Toxicology: An insecticide. Large doses or heavy ex-

posure may cause hemolytic anemia and toxic de-
generation of the liver. Can cause skin irritation
and photosensitization. Used as a food additive
permitted in the feed and drinking water of ani-
mals and/or for the treatment of food producing
animals. Also permitted in food for human con-
sumption (Section 10). Oral LD_{50} (rats) = 5 g/kg.

Disaster Hazard: Dangerous; when heated to decompo-
sition, or on contact with acid or acid fumes, it
emits highly toxic fumes of SO_x and NO_x .

Countermeasures

Personnel Protection: Section 2.

Storage and Handling: Section 7.

PHENOTHIOXIN

General Information

Synonym: dibenzothioxin.

A powder.

Formula: $C_{12}H_8O_2S$.

Mol wt: 200.2.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: U.

Acute Systemic: Ingestion 2.

Chronic Local: Irritant 2.

Chronic Systemic: Ingestion 2.

Toxicology: Animal experiments have shown evidence
of liver damage and skin irritation.

Disaster Hazard: Dangerous; when heated to decompo-
sition, it emits highly toxic fumes of sulfur com-
pounds.

Countermeasures

Storage and Handling: Section 7.

2-PHENOXYETHANOL. See ethylene glycol phenyl
ether.

2-PHENOXYETHYL ACETATE. See ethylene glycol
phenyl ether acetate.

n-(β -PHENOXYETHYL)ANILINE

General Information

Insol. in water.

Formula: $C_{12}H_{11}OCH_2CH_2C_6H_5-NH_2$.

Mol wt: 213, d: 1.1, bp: 202°C, flash p.: 338°F.

Hazard Analysis

Toxicity: No details. Probably toxic. See also aniline.

Fire Hazard: Slight, when exposed to heat or flame.

Countermeasures

Storage and Handling: Section 7.

To Fight Fire: Water, foam. Section 7.

PHENOXYETHYL CHLORIDE. See β -chlorophene-
tole.

PHENOZONE. See antipyrine.

***n*-PHENYLACETAMIDE.** See acetanilide.

PHENYL ACETATE

General Information

Synonym: acetyl phenol.

Water white liquid; infinitely sol. in alcohol and ether;
slightly sol. in water. Highly refractive.

Formula: $CH_3COOC_6H_5$.

Mol wt: 136, d: 1.073 at 25°/25°C, bp: 195–196°C, vap.
d.: 4.7, flash p.: 176°F.

Hazard Analysis

Toxicity: U. See esters and phenol. Probably toxic.

TOXIC HAZARD RATING CODE (For detailed discussion, see Section 9.)

0 NONE: (a) No harm under any conditions; (b) Harmful
only under unusual conditions or overwhelming dosage.

1 SLIGHT: Causes readily reversible changes which dis-
appear after end of exposure.

2 MODERATE: May involve both irreversible and revers-

ible changes not severe enough to cause death or perma-
nent injury.

3 HIGH: May cause death or permanent injury after very
short exposure to small quantities.

U UNKNOWN: No information on humans considered
valid by authors.

C-15

Mol wt: 441.
Hazard Analysis
 Toxicity: U. A food additive permitted in food for human consumption (Section 10).

PTOMAINES

Hazard Analysis

Toxic Hazard Rating:

Acute Local: U.
 Acute Systemic: Ingestion 3.
 Chronic Local: U.
 Chronic Systemic: U.

Toxicology: These are exceedingly toxic compounds commonly formed in putrefying proteins, dead bodies, decayed meat and fish. They have been prepared synthetically and are derivatives of ethers of the polyhydric alcohols. "Ptomaine poisoning" is usually a misnomer for other forms of food poisoning.

PUBLIC HEALTH HAZARDS FROM SOLID WASTES. See Section 6.

PULSATILLA POWDER

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 1.
 Acute Systemic: U.
 Chronic Local: U.
 Chronic Systemic: U.

Fire Hazard: Moderate, when exposed to heat or flame; can react with oxidizing materials (Section 7).

Explosion Hazard: Slight, when exposed to flame.

Countermeasures

Ventilation Control: Section 2.
 Personal Hygiene: Section 2.
 Storage and Handling: Section 7.

PURPLE FOXGLOVE. See digitalis.

PURPUREO. See chloropentammine cobalt (III) chloride.

PVP. See polyvinylpyrrolidone.

PYRAZOTHION. See *o,o*-diethyl-*o*-(3-methyl-5-pyrazolyl) phosphorothioate.

PYRAZOXON. See *o,o*-diethyl *o*-(3-methyl-5-pyrazolyl) phosphate.

PYRENE

General Information

Synonym: benzo [d e f] phenanthrene.
 Colorless solid; solutions have a slight blue color; insol. in water; fairly sol. in organic solvents.

Formula: $C_{20}H_{12}$ (a condensed ring hydrocarbon).

Mol wt: 202.24, mp: 156°C, d: 1.271 at 23°C, bp: 404°C.

Hazard Analysis

Toxicology: A recognized carcinogen.

PYRETHRIN I

General Information

Synonym: pyrethrolone ester of chrysanthemum monocarboxylic acid.

Viscous liquid.

Formula: $C_{21}H_{22}O_5$.

Mol wt: 328.4, bp: 170°C at 0.1 mm decomp.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2; Allergen 2.

Acute Systemic: Ingestion 2; Inhalation 3; Allergen 3.

Chronic Local: U.

Chronic Systemic: Ingestion 2; Inhalation 3.

Toxicology: Has produced diarrhea, convulsions, collapse and respiratory failure, nausea, tinnitus, headache and CNS upset. Oral LD_{50} (rats) = 1.2 g/kg.

Fire Hazard: Slight (Section 7).

Countermeasures

Ventilation Control: Section 2.

Personal Hygiene: Section 2.

Storage and Handling: Section 7.

PYRETHRIN II

General Information

Synonym: pyrethrolone ester of chrysanthemum dicarboxylic acid monomethyl ester.

Viscous liquid.

Formula: $C_{22}H_{22}O_6$.

Mol wt: 372.4, bp: 200°C at 0.1 mm decomp.

Hazard Analysis

Toxicity: See pyrethrin I.

PYRETHRINS. See pyrethrin I and II.

Shipping Regulations: Section 11.

Regulated by IATA.

PYRETHROLONE ESTER OF CHRYSANTHEMUM DICARBOXYLIC ACID MONOMETHYL ESTER. See pyrethrin II.

PYRETHROLONE ESTER OF CHRYSANTHEMUM MONOCARBOXYLIC ACID. See pyrethrin I.

PYRETHROSIN

General Information

Crystals; insol. in water; sol. in hot alcohol, chloroform; slightly sol. in ether of petroleum ether.

Formula: $C_{17}H_{22}O_5$.

Mol wt: 306.4, mp: 199°C.

Hazard Analysis

See pyrethrin I.

PYRETHRUM FLOWERS *

General Information

Synonym: dalmatian insect powder.

Fine powder.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2; Allergen 2.

Acute Systemic: Ingestion 2; Inhalation 2.

Chronic Local: Irritant 2; Allergen 2.

Chronic Systemic: Ingestion 2; Inhalation 2.

Toxicology: Can cause dermatitis of both allergic and contact types. See also pyrethrin I. Large doses can cause hyper-excitability, incoordination, tremors and muscular paralysis.

PYRIDINE *

General Information

Colorless liquid; sharp, penetrating, empyreumatic odor; burning taste.

Formula: $NCHCHCHCHCH$.

Mol wt: 79.10, bp: 115.3°C, l_{el} = 1.8% u_{el} = 12.4%,
 fp: -42°C, flash p.: 68°F (C.C.), d: 0.982, autoign.
 temp.: 900°F, vap. press.: 10 mm at 13.2°C, vap.
 d.: 2.73.

TOXIC HAZARD RATING CODE (For detailed discussion, see Section 9.)

0 NONE: (a) No harm under any conditions; (b) Harmful only under unusual conditions or overwhelming dosage.

1 SLIGHT: Causes readily reversible changes which disappear after end of exposure.

2 MODERATE: May involve both irreversible and revers-

ible changes not severe enough to cause death or permanent injury.

3 HIGH: May cause death or permanent injury after very short exposure to small quantities.

U UNKNOWN: No information on humans considered valid by authors.

Hazard Analysis**Toxic Hazard Rating:**

Acute Local: Irritant 2.

Acute Systemic: Ingestion 2; Inhalation 1; Skin Absorption 2.

Chronic Local: U.

Chronic Systemic: Ingestion 2; Inhalation 2; Skin Absorption 2.

Toxicology: Is mildly irritating to skin and can cause CNS depression. Kidney, liver damage and GI upset also.**Fire Hazard:** Dangerous, when exposed to heat or flame. Spontaneous Heating: No.**Explosion Hazard:** Severe, in the form of vapor, when exposed to flame or spark.**Disaster Hazard:** Dangerous; when heated to decomposition, it emits highly toxic fumes of cyanides; can react vigorously with oxidizing materials.**Countermeasures****Ventilation Control:** Section 2.**To Fight Fire:** Carbon dioxide, dry chemical or carbon tetrachloride (Section 7).**Personnel Protection:** Section 2.**Storage and Handling:** Section 7.**Shipping Regulations:** Section 11.

Regulated by CG, DOT, IATA.

2-PYRIDINE ALDOXIME METHIODIDE. See 2-PAM.**PYRIDINE-3-CARBOXYLIC ACID.** See niacin.**3-PYRIDINE METHANOL****General Information**Synonym: β -pyridyl carbinol.

Very hygroscopic liquid. Water soluble.

Formula: C_7H_9NO .

Mol wt: 109.1, bp: 154°C at 28 mm.

Hazard Analysis**Toxicity:** Can cause gastrointestinal distress, flushing of skin, dizziness and paresthesia.**Disaster Hazard:** Dangerous, when heated to decomposition, it emits highly toxic fumes of NO_2 .**PYRIDINE-n-OXIDE****General Information**

Water-soluble crystals.

Formula: C_5H_7NO .

Mol wt: 95.1, fp: 67.0°C, bp: 102°C at 1 mm.

Hazard Analysis**Toxicity:** Details unknown. See pyridine.**Fire Hazard:** Moderate, when exposed to heat or flame (Section 7).**Disaster Hazard:** Dangerous; when heated to decomposition, it emits toxic fumes of NO_2 ; can react with oxidizing materials.**Countermeasures****Storage and Handling:** Section 7.**PYRIDINIUM PERCHLORATE.** See perchlorates.**PYRIDINOTRIBROMOGOLD****General Information**

Red crystals, water soluble.

Formula: $(C_5H_4N)AuBr_3$.

Mol wt: 516.1, mp: 150°C (decomp.).

Hazard Analysis and Countermeasures

See gold compounds and bromides.

PYRIDOXINE HYDROCHLORIDE**General Information**Commercial form of pyridoxine (Vitamin B_6); colorless, white platelets; sol. in water, alcohol, acetone;

* This material has been assigned a Threshold Limit Value by ACGIH. See complete reprint of TLV's in Section 1.

slightly sol. in other organic solvents.

Formula: $C_5H_9O_2N \cdot HCl$.

Mol wt: 205.5, mp: 204–206°C.

Hazard Analysis**Toxic Hazard Rating:** U.**Toxicity:** A food additive permitted in food for human consumption (Section 10). **β -PYRIDYL CARBINOL.** See 3-pyridinemethanol.**PYRIDYL MERCURIC ACETATE****Hazard Analysis**

A fungicide, highly toxic. See mercury compounds, organic.

PYRIDYL MERCURIC CHLORIDE. See mercury compounds, organic. **β -PYRIDYL- α -METHYLPYRROLIDINE.** See nicotine.**PYRIDYL METHYL STEARATE****Hazard Analysis****Toxicity:** A fungicide. Details unknown.**Disaster Hazard:** Dangerous, when heated to decomposition, it emits highly toxic fumes.**Countermeasures****Storage and Handling:** See Section 7. **β -PYRIDYL- α -PYRROLIDINE.** See nornicotine.**PYROANTIMONATE.** See potassium hydroxoantimonate.**PYROARSENIC ACID****General Information**

Colorless crystals.

Formula: H_3AsO_4 .

Mol wt: 265.9, mp: decomp. at 206°C.

Hazard Analysis and Countermeasures

Highly toxic. See arsenic compounds.

PYROCATECHIN. See pyrocatechol.**PYROCATECHOL****General Information**

Synonyms: 1,2-benzendiols; catechol; pyrocatechin; o-dihydroxybenzene.

Colorless crystals.

Formula: $C_6H_4(OH)_2$.

Mol wt: 110.11, mp: 105°C, bp: 246°C, flash p.: 24°F (C.C.), d: 1.341 at 15°C, vap. press.: 10 mm at 118.3°C, vap. d.: 3.79.

Hazard Analysis**Toxic Hazard Rating:**

Acute Local: Irritant 3; Allergen 1.

Acute Systemic: Ingestion 3; Inhalation 3; Skin Absorption 3.

Chronic Local: Allergen 2.

Chronic Systemic: Ingestion 3; Inhalation 3; Skin Absorption 3.

Toxicology: Can cause convulsions and injury to blood.See also phenol. Oral LD_{50} (rats) = 3.9 g/kg.**Fire Hazard:** Slight, when exposed to heat or flame.

Spontaneous Heating: No.

Disaster Hazard: Dangerous; when heated, it emits highly toxic fumes; can react with oxidizing materials.**Countermeasures****Ventilation Control:** Section 2.**To Fight Fire:** Water, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).**Personnel Protection:** Section 2.**Storage and Handling:** Section 7.**Note:** For an in-depth discussion of storage and handling and control of fires see Section 7.**PYROCELLULOSE****PYROCHROLO****PYROGALLIC****PYROGALLIC****General Information**

Synonyms: pyrogallol

benzene.

White, lustrous

Formula: $C_6H_3O_3$

Mol wt: 126.1

4°/4°C, va

Hazard Analysis**Toxic Hazard Rating:**

Acute Local:

Acute Systemic:

Chronic Local:

Chronic Systemic:

Toxicology: If

rhea. Conv

methemogi

age and dec

Disaster Hazard:

highly toxic

Countermeasures**Ventilation Control:****Personnel Protection:****Storage and Handling:****PYROLAN****General Information**

Synonyms: G-2

methyl carb

Crystals. Water

Formula: C_7H_9N

Mol wt: 245.3, m

Hazard Analysis**Toxicity:** Highly

and a recogn

mates. A che

Disaster Hazard:

sition, it emi

PYROLIGNEOL**General Information**

Synonym: wood

Yellowish, acidic

Formula: $HC_2H_3O_2$ **Hazard Analysis****Toxic Hazard Rating:**

Acute Local: I

Acute Systemic:

Chronic Local:

Chronic Systemic:

PYROMELLITIC**General Information**

Synonyms: (PMA)

Off-white powder

Formula: $C_4H_2O_4$

Mol wt: 254.15, m

Hazard Analysis**Toxicity:** A primar**Fire Hazard:** Slight

NONE: (a) No

only under unusu

SLIGHT: Causes

appear after end

MODERATE: M

ments with animals, it was found that an exposure of 20 minutes to a concentration of 17.5 ppm was fatal to cats. It is classified as a corrosive liquid and can cause burns of the skin, eyes, and mucous membranes wherever it comes in contact with the body. See also hydrogen chloride and sulfur dioxide.

Disaster Hazard: Corrosive. See hydrochloric acid and sulfur dioxide.

Countermeasures

Ventilation Control: Section 2.

Treatment and Antidotes: Personnel exposed should follow the treatment outlined under hydrogen chloride and sulfur dioxide.

Personnel Protection: Section 2.

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

THIONYL CHLORIDE FLUORIDE

General Information

Gas.

Formula: SOClF.

Mol wt: 102.52, mp: -139.5°C, bp: 12.2°C.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 3.

Acute Systemic: Inhalation 3.

Chronic Local: Irritant 2; Inhalation 3.

Chronic Systemic: Inhalation 2.

Disaster Hazard: Dangerous; when heated, it emits highly toxic fumes; will react with water or steam to produce toxic and corrosive fumes.

Countermeasures

Ventilation Control: Section 2.

Personnel Protection: Section 2.

Storage and Handling: Section 7.

THIONYL FLUORIDE

General Information

Colorless gas. Suffocating odor.

Formula: SOF₂.

Mol wt: 86.07, bp: -44°C, d: 2.93, mp: -130°C.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 3.

Acute Systemic: Inhalation 3.

Chronic Local: Inhalation 3.

Chronic Systemic: Inhalation 3.

Disaster Hazard: Dangerous; when heated, it emits highly toxic fumes; will react with water or steam to produce toxic and corrosive fumes.

Countermeasures

Ventilation Control: Section 2.

Personnel Protection: Section 2.

First Aid: Section 9.

Storage and Handling: Section 7.

THIOPHANATE

General Information

Synonym: 1,2-bis(3-ethoxycarbonyl-2-thioureido) benzene.

Colorless plate-like crystals.

Formula: C₁₄H₁₂O₄N₄S₂.

Mol wt: 380.3, mp: 195°C (decomp.).

Hazard Analysis

Toxicity: A system

icity. Acute or

Disaster Hazard: D

THIOPHENE

General Information

Synonym: thiofuran.

Clear and colorless liquid.

Formula: SCHCHCHCH.

Mol wt: 84.13, bp: 84.1°C, fp: -38.3°C, flash p.: 30°F, d: 1.0583 at 25°/4°C, vap. press.: 40 mm at 12.5°C, vap. d.: 2.9.

Hazard Analysis

Toxicity: Animal experiments suggest moderate toxicity. S.c. MLD (rabbits) = 830 mg/kg.

Fire Hazard: Dangerous, when exposed to heat or flame.

Disaster Hazard: Dangerous; when heated to decomposition, it emits highly toxic fumes of SO₂; can react vigorously with oxidizing materials.

Countermeasures

Ventilation Control: Section 2.

To Fight Fire: Foam, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

Storage and Handling: Section 7.

THIOPHENOL. See phenyl mercaptan.

α-THIOPHENYLBORIC ACID

General Information

Colorless crystals; sol. in water.

Formula: (C₆H₅S)B(OH)₂.

Mol wt: 128.0, mp: 134°C.

Hazard Analysis and Countermeasures

See boron compounds and sulfates, and phenyl mercaptan.

THIOPHOS. See parathion.

THIOPHOSGENE

General Information

Synonyms: thiocarbonyl chloride; thiocarbonyl chloride.

Reddish liquid.

Formula: CSCL₂.

Mol wt: 115, bp: 73.5°C, d: 1.5085 at 15°C.

Hazard Analysis

Toxicity: Details unknown. A very strong irritant. See also phosgene. Highly toxic.

Disaster Hazard: Dangerous. When heated to decomposition, or upon hydrolysis it emits highly toxic fumes.

Countermeasures

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by CG, DOT, IATA.

THIOPHOSPHORAMIDE

General Information

Amorphous, yellow-white powder.

Formula: PS(NH₂)₂.

Mol wt: 111.12, mp: decomposes at 200°C, d: 1.7 at 13°C.

Hazard Analysis

Toxicity: Unknown. See also amides.

Disaster Hazard: Dangerous; when heated to decomposition, or on contact with acid or acid fumes, it emits highly toxic fumes of SO₂ and PO₂.

Countermeasures

Storage and Handling: Section 7.

TOXIC HAZARD RATING CODE (For detailed discussion, see Section 9.)

0 NONE: (a) No harm under any conditions; (b) Harmful only under unusual conditions or overwhelming dosage.

1 SLIGHT: Causes readily reversible changes which disappear after end of exposure.

2 MODERATE: May involve both irreversible and revers-

ible changes not severe enough to cause death or permanent injury.

3 HIGH: May cause death or permanent injury after very short exposure to small quantities.

U UNKNOWN: No information on humans considered valid by authors.

which constitute vitamin E. These vitamin constituents are viscous oils; sol. in lipid solvents; insol. in water.

Hazard Analysis

Toxic Hazard Rating: U. Used as chemical preservative, nutrient, and/or dietary supplement food additives (Section 10).

TOE PUFFS**General Information**

Toe puffs are box toe boards used in the manufacture of boots and shoes and may consist of several layers of fabric impregnated with celluloid solvent, rosin, and dye.

Hazard Analysis

Toxic Hazard Rating: U.

Fire Hazard: Dangerous. They are liable to spontaneous combustion.

Countermeasures

Shipping Regulations: Section 11.

Regulated by IATA.

TOLAMINE. See sodium *p*-toluenesulfonchloramine.

TOLAN. See diphenyl acetylene.

***o*-TOLIDINE.** A recognized carcinogen (Section 8). See aromatic amines.

o*-TOLIDINE FLUOSILICATE*General Information**

Small white crystals; slightly sol. in alcohol.

Formula: $(C_6H_5NH_2CH_3)_2 \cdot H_2SiF_6$.

Mol wt: 356.4, mp: 269°C.

Hazard Analysis and Countermeasures
See fluosilicates and fluorides.

TOLUENE ***General Information**

Synonyms: methylbenzene; phenylmethane; toluol.

Colorless liquid; benzol-like odor.

Formula: $C_6H_5CH_3$.

Mol wt: 92.13, mp: -95°C to -94.5°C, bp: 110.4°C, flash p.: 40°F (C.C.), ulc: 75-80, lel = 1.27%, uel 7.0%, d: 0.866 at 20°/4°C, autoign. temp.: 947°F, vap. press.: 36.7 mm at 30°C, vap. d.: 3.14.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 1.

Acute Systemic: Ingestion 2; Inhalation 2; Skin Absorption 1.

Chronic Local: Irritant 1.

Chronic Systemic: Ingestion 2; Inhalation 2; Skin Absorption 2.

Toxicology: Toluene is derived from coal tar, and commercial grades usually contain small amounts of benzene as an impurity. Acute poisoning, resulting from exposures to high concentrations of the vapors, are rare with toluene. Inhalation of 200 ppm of toluene for 8 hours may cause impairment of coordination and reaction time; with higher concentrations (up to 800 ppm) these effects are increased and are observed in a shorter time. In the few cases of acute toluene poisoning reported, the effect has been that of a narcotic, the workman passing through a stage of intoxication into one of coma. Recovery following removal from exposure has been the rule. An occasional report of chronic poisoning describes an anemia and leucopenia, with biopsy showing a bone marrow hypoplasia. These effects, however, are less common in people working with toluene, and they are not as severe.

- * This material has been assigned a Threshold Limit Value by ACGIH. See complete reprint of TLV's in Section 1.

Exposure to concentrations up to 200 ppm produces few symptoms. At 200 to 500 ppm, headache, nausea, loss of appetite, a bad taste, lassitude, impairment of coordination and reaction time are reported, but are not usually accompanied by any laboratory or physical findings of significance. With higher concentrations, the above complaints are increased and in addition, anemia, leucopenia and enlarged liver may be found in rare cases.

A common air contaminant.

Fire Hazard: Dangerous, when exposed to heat or flame.

Spontaneous Heating: No.

Explosion Hazard: Moderate, when exposed to flame.

Disaster Hazard: Moderately dangerous; when heated, it emits toxic fumes; can react vigorously with oxidizing materials.

Countermeasures

Ventilation Control: Section 2.

To Fight Fire: Foam, carbon dioxide, dry chemical or carbon tetrachloride (Section 7).

Personnel Protection: Section 2.

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by IATA.

1-*o*-TOLUENEAZONAPHTHYLAMINE-2. See yellow OB.

2,4-TOLUENEDIAMINE**General Information**

Synonym: tolylenediamine.

Prisms.

Formula: $CH_3C_6H_4(NH_2)_2$.

Mol wt: 122.17, mp: 99°C, bp: 280°C, vap. press.: 1 mm at 106.5°C.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2.

Acute Systemic: Ingestion 2; Inhalation 2.

Chronic Local: U.

Chronic Systemic: Ingestion 2; Inhalation 2.

Toxicology: This material has a marked toxic action upon the liver and can cause fatty degeneration of that organ. It is also thought to be an irritant. When solutions of it come in contact with the skin, it can cause irritation and blisters, particularly to individuals who are sensitive to it.

Disaster Hazard: Moderately dangerous; when heated, it emits toxic fumes.

Countermeasures

Ventilation Control: Section 2.

Personal Hygiene: Section 2.

Storage and Handling: Section 7.

Shipping Regulations: Section 11.

Regulated by IATA.

2,5-TOLUENDIAMINE**General Information**

Synonyms: 2,5-tolylenediamine; 2,5-diaminotoluene.

Colorless, crystalline tablets.

Formula: $CH_3C_6H_4(NH_2)_2$.

Mol wt: 122.17, mp: 64°C, bp: 274°C.

Hazard Analysis

Toxic Hazard Rating:

Acute Local: Irritant 2.

Acute Systemic: Ingestion 2; Inhalation 2;

Chronic Local: U.

Chronic Systemic: Ingestion 2; Inhalation 2.

Toxicology: This material has a toxic action upon the liver and can cause fatty degeneration of that organ. Its total effect upon the body seems to take

Note: For an in-depth discussion of storage and handling and control of fires see Section 7.

place 3 di...
nervous sys...
the liver a...
destruction...
it is quite s...
identical w...
fact that th...
makes it so...
particularly...
literature co...
jury to an e...
eyelash dye...
material. It...
fingers of in...
it.

Disaster Hazard: it emits toxic

Countermeasures

Ventilation Contr

Personal Hygiene

Storage and Hand

TOLUENE DIIS
cyanate.

TOLUENE SUBS**General Informati**

Composed largely

Bp: 100°C, flash p.

Hazard Analysis

Toxicity: See octa

Fire Hazard: Da

flame.

Explosion Hazard:

Disaster Hazard:

flame; can re

rials.

Countermeasures

Storage and Handi

To Fight Fire: Fe

or carbon tetr

o*-TOLUENESULF*General Information**

Synonym: methylb

Crystals.

Formula: $CH_3C_6H_4$.

Mol wt: 172.2.

Hazard Analysis

Toxic Hazard Ratin

Acute Local: Irrit

Acute Systemic: 1

Chronic Local: U

Chronic Systemic

Toxicity: See also *p*-

Disaster Hazard: D

Countermeasures

Storage and Handlin

p*-TOLUENESULF*General Information**

Synonym: *p*-toluene

Colorless leaflets; sol

Formula: $C_6H_4(SO_2)$

Mol wt: 172, mp: 10

Hazard Analysis

Toxicity: Details us

0 NONE: (a) No ha...
only under unusual

1 SLIGHT: Causes...
appear after end of

2 MODERATE: May

C-19

ATTACHMENT D

FORMER COAL GASIFICATION FACILITIES BRIEFING MEMORANDUM SEPTEMBER 20, 1983

GENERAL OVERVIEW

An investigation by the Division of Waste Management's Bureau of Field Operations of a surface water pollution problem in Belmar, Monmouth County, led investigators to what was a Coal Gasification Facility. Further investigation indicated that the problem may be State wide in that most every established city in the early 1900's had a local gas plant that could have similar problems as the Belmar site.

There were basically three types of gas plants that operated throughout New Jersey and the country, during the late 1880's and early 1900's, oil, coal and coke. Coal or coke was used as the raw material in the 1800's and oil for the most part, was not used as a feed material until the 1930's and 40's. The basic process for all the plants involved heating the oil, coal or coke to drive off volatile gases which became the product for use. However, this process also produced coal tar or oil still bottoms as a by-product. For the most part, this material was considered a waste and disposed of on and off the site. However, around 1920 the tars did begin to have some commercial use wood treating, chemical feedstocks and road material.

The coal tars and still bottoms contain significant concentrations of polynuclear aromatic hydrocarbons (PAHs). This group of organic compounds includes, pyrenes and anthracenes, among others, and known and suspected carcinogens. The material is not considered to be highly mobile in the aquatic environment but under certain conditions individual components of the material can readily migrate through ground and surface water. Components of the material also readily volatilize into the air producing pungent odors.

Due to the disposal practices at the time, namely, disposal in open pits and the current knowledge of the hazards of the material the Department has instituted a State wide investigation of these sites. Initially, we will be identifying the sites and gathering all the available information on each of them. Once identified an initial assessment can be performed to prioritize the sites for future remedial actions, if needed. To date, we have identified 43 potential sites in the State, of those 11 are actively being investigated and evaluated.

Current Status

A list of the sites identified to date is attached. Individual status sheets for the active sites are also attached.

All the utility companies have responded to the Commissioner's August 22 letter.

South Jersey Gas actually sent their own letter prior to the Commissioner's identifying 12 sites where coal tars may have been generated, 6 have been confirmed as manufacturing sites. At a meeting with SJG on September 14, Mr. Kindle, VP, expressed a willingness to hire a consultant to evaluate all the sites. He stated he would have to contact other parties that are involved

before SJG could commit to the studies. Some of SJG's Sites were operated by PSE & G.

Of SJG's sites, Atlantic City - Kirkman Blvd. and Glassboro are considered active cases.

New Jersey Natural Gas and Jersey Central Power and Light have agreed to work together. They currently have 10 sites between them, 9 have been confirmed. JCP&L has taken the lead for the two companies and has begun extensive work on the Belmar Site and has issued a RFP for the Long Branch Site. NJNG is currently involved in remedial action negotiations with the Division of Water Resources on the Dover Site. Both companies are searching their records for more information and HSMA should be meeting with them next week. NJNG bought their most, if not all, their sites from JCP&L and thus the cooperation.

Atlantic City Electric never operated any Coal Gas Facilities, however, they currently own the NJNG/JCP&L Ocean City site and have contracted Roy F. Weston to study the site. A preliminary report is due within the next month.

Public Service Electric & Gas has confirmed 8 sites 3 of which still exist. They are still searching their records for information and should be ready to meet with HSMA next week.

Elizabethtown Gas has confirmed 8 sites. In a meeting on September 16, Mr. Fleming, VP, stated he is willing to contract for a consultant to evaluate the sites, he only has to convince the company to make the commitment. E-Town Gas has retained David Bardin as their attorney for this matter. Some of Elizabethtown's sites were operated by JCP&L or one of their corporate predecessors.

SEPTEMBER 20, 1983
COMPILED BY: NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
HAZARDOUS SITE MITIGATION ADMINISTRATION

COAL GASIFICATION PLANTS

South Jersey Gas Company

1. Atlantic City - Kirkman Boulevard
2. Atlantic City - Florida, Georgia and Sunset Avenues
3. Pleasantville - Franklin Avenue
4. Egg Harbor - Atlantic and Buffalo Avenues
5. Hammonton - Twelfth Street
6. Bridgeton - Vine and Water Streets
7. Millville - North Second Street
8. Glassboro - Union and Grove Streets
9. Paulsboro - Jefferson Street east of Billingsport Road
10. Swedesboro - Auburn Road and Bridgeport Road
11. Penns Grove - Pitman Street and the Railroad Tracks
12. Salem - Fifth and Howell Streets

New Jersey Natural Gas Company/Jersey Central Power & Light

1. Dover in Morris County - Carrol Street
2. Belmar - 16th and Railroad
3. Cape May City - Lafayette and St. John Streets
4. Ocean City - 11th & West (Atlantic City Electric)
5. Long Branch - Long Branch Avenue & Brook Street
6. Lakewood - Clover Street & Laurel Avenue
7. Toms River - Water Street
8. Wildwood - West Barfield & Lincoln Avenue

Public Service Electirc & Gas

1. Camden City - 2nd & Spruce Street
2. Trenton - New York & Sylvester Street
- *3. Edison - New Brunswick - 410 Silver Lake
- *4. Harrison - 4th Street
- *5. Jersey City (West end) - St. Paul & Duffield
6. Patterson - 200th & 5th Street
7. Newark - Market Street

Elizabethtown Gas

1. Elizabeth - Erie Street between Third & Florida
2. Elizabeth - at South Street & Center Streets
3. Perth Amboy at Margeret Street
4. Rahway intersection Central, Hamilton, Irving
5. Flemington at E. Main Street
6. Nwton at Driller Avenue
7. Lambertville at S. Main at Ferry Street
8. Washington Boro (Warren) S. Linclon at R.R. Tracks

Other Sites

1. Atlantic Highlands - Leonard Avenue
2. Kearny - Koppers Coke
3. Kearny - Fish House Road
4. Princeton - Whitherspoon Street
5. Asbury Park - Sewell & Prospect Street
6. West Paterson - Memorial Drive
7. Tuckahoe
8. Jersey City - Newport City Project

*Still existing

The overlapping of some of the sites is a result of an act requiring PSE&G and JCP&L to divest their gas holdings. This occurred around 1950 and the plants only operated for a short time afterwards. Because of this it seems the smaller gas companies might look toward the larger utility companies for money.

We hope that the companies can work among themselves to achieve a funding scheme. However, if it becomes necessary to institute expensive remedial actions at these sites the "Who's Going to Pay" may become a major problem. To try to avert this situation we would like to involve the BPU and Public Advocate in this project now. This will aid us in two ways. One, smoothing the way for the facilities to get any rate hikes needed to pay for remedial action and second allowing us to use the BPU's influence to achieve our desired results from the companies.

None of the sites to date can be classified as imminent hazards and from what information has been gathered none of the sites will be imminent hazards. For the most part the main concern will be worker and residential exposure from the current and future uses of these sites. Contamination of potable water at this time is not a problem the vast majority of the sites are in areas served by public water supplies. Ground and surface water contamination is anticipated to be an environmental concern rather than a public health concern.

Ronald J. Young received degrees from Tennessee Technological University and the University of Cincinnati. He has presented a number of papers before learned societies, published a score of articles, and is chairman of the Energy Committee.

ATTACHMENT E

Coal gasification — historical perspective

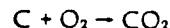
RONALD J. YOUNG, CIH
Energy Committee

The history of coal gasification can be traced to 1691 when John Clayton discovered that an inflammable vapor could be produced by distilling coal.⁽¹⁻³⁾ However, it was not until 1779 that William Murdoch succeeded in manufacturing gas from coal in a crude retort and illuminated his home with a "wickless flame."⁽³⁾ It must be remembered that at this period, the only sources of artificial light were candles and lamps, thus it seemed scarcely possible that an illuminating flame could be obtained without a wick. Murdoch did not reap the reward of his discovery, and in 1799 a Frenchman named Philippe Lebon received a patent in Paris for making an illuminating gas from wood, and gave an exhibition in 1802.^(1,3) It was seen by a German, named Winsor, who made Lebon an offer for his secret process for use in Germany. This offer was declined, but Winsor studied the process and he marketed his invention in Germany. Winsor then came to England and gave lectures on gas lighting in 1804. He founded the first coal gas company, Gas Light and Coke Company, in London in 1812.^(1,3) This facility is depicted in Figure 1.⁽⁴⁾ The first U.S. company was chartered in Baltimore in 1816.⁽⁵⁾

By 1900, the coal gas plants had become more complex as shown in Figure 2.⁽³⁾ The coal was heated in D-shaped retorts in the absence of air. The gas from the retorts flowed into a hydraulic main, where a portion of the water and coal tar condensed.⁽⁶⁾ The gas next passed through an atmospheric condenser, where further condensation of water and coal tar took place, and a majority of the ammonia dissolved in the condensed water. The gas then flowed through scrubbers where some H_2S and CS_2 were removed along with the final traces of tar and ammonia.⁽³⁾ Next, the gas flowed to purifiers (trays containing iron oxide) where the remaining sulfur compounds were removed. The purified gas was stored in large tanks

from which it was delivered to the street mains. With over 70% of the coal remaining a solid when heated, this portion had to be sold to maintain a competitive price. A similar type of gas is produced when coal is carbonized to manufacture coke; frequently coke-oven gas supplemented coal gas when it was available locally and coal gas was in short supply.⁽⁵⁾

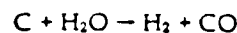
Other methods that used all of the coal rather than just distillation products were devised to further supplement coal gas supplies. The most widely used process was developed by Lowe in 1875 and produced a gas known as "water gas" or "blue gas." A schematic diagram of Lowe's process is shown in Figure 3.⁽⁷⁾ A bed of noncaking coal or coke was brought to an acceptable temperature and blasted with air. The "blow reaction" was:⁽¹⁾



As the coal in the upper part of the bed became hot, the following reaction occurred:^(5,8)



After enough coal had been heated, the air blasted was discontinued and steam was introduced, resulting in the following reaction:



The gas produced has a heating value of about 300 Btu/ft³ and had to be enriched to be compatible with coal gas (475-560 Btu/ft³).⁽⁵⁾

The enrichment process was also cyclical. Gases from the last part of the "blow" cycle were burned to heat refractory bricks enclosed in a "carburetor" vessel. When the bricks were hot enough, the gas was shut off and oil was sprayed on the bricks, where it was "cracked" into lower molecularweight hydrocarbons, including methane and propane. The resulting gas, which has a high heating value,

E-2

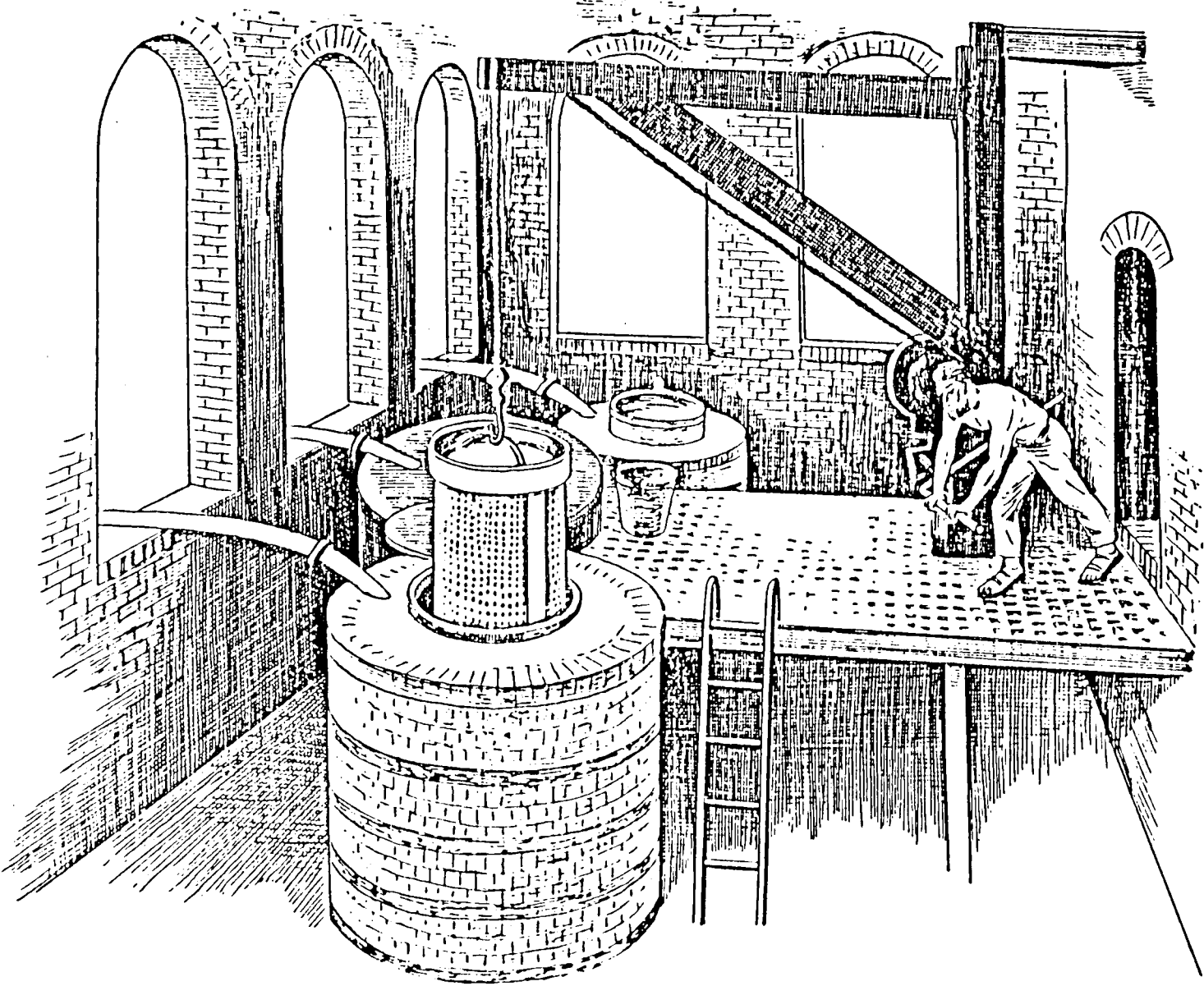


Figure 1 — The first coal gas company — circa 1812.⁽⁴⁾

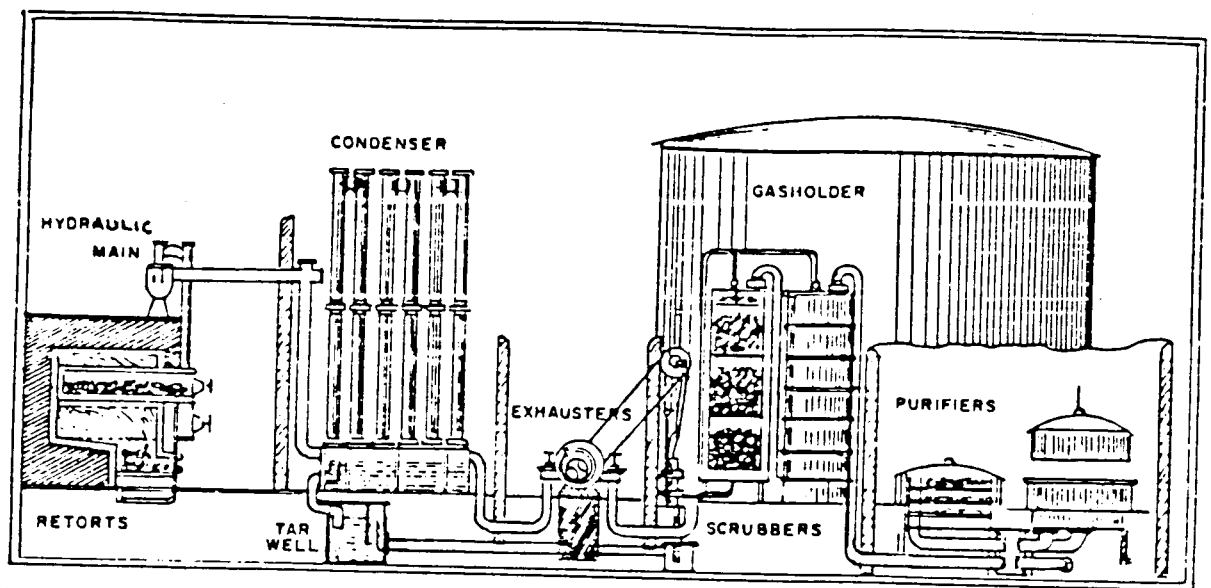


Figure 2 — Coal gas plant — circa 1900.⁽³⁾

was mixed with the gas made during the run period.⁽⁵⁾

Then there was "producer gas," which was even cheaper than "water gas." Producer gas was used extensively because of its "cheapness, cleanliness, and the regularity of the temperature obtained."⁽⁷⁾ The conception of the producer gas process is credited to Wilhelm Frederick von Faber du Faur of Germany.⁽²⁾ However, because of sickness, he could not pursue his research so he communicated his ideas to Bischof who subsequently built the first gas producer in 1839.^(2,3) A diagram of this simple producer is shown in Figure 4.⁽²⁾ However, it was not until 1857 that Siemens incorporated a system of regeneration and developed the first commercially successful producer.^(2,3) The Siemens producer is shown in Figure 5.⁽⁷⁾

Producer gas was made in a continuous process wherein a bed of hot coal or coke was blasted with air or a mixture of steam and air. The final product necessarily contained nitrogen from the air and carbon dioxide resulting from the combustion of carbon with oxygen. Producer gas was used at industrial plants needing a clean source of fuel but for which the cost of transport and distribution of the gas was not important.⁽⁵⁾

The technology of making water gas and producer gas was steadily improved in the United

States. By the mid-1920s, there was 150 manufactures of producers in the world and nearly 12,000 producers in the United States alone.⁽⁹⁾ At that time, gasifiers fed gas to engines, heating furnaces, and kilns.⁽¹⁰⁾ The residential gas market in the eastern United States was supplied mainly with manufactured gas as late as 1932. But with the introduction of long-distance natural gas pipelines during World War II, natural gas rapidly became more widely distributed, and by the end of the war, it was supplying nearly 90% of the market.⁽⁸⁾ By 1948, there was still 2000 gasifiers in use; however, the number has since diminished so that no significant number of commercial gasifiers are presently used in the United States.⁽¹⁰⁾ The reason for disappearance of the gas producers were:⁽¹¹⁾

- Its production of dirty gas — high in dust, soot and tar — which was objectionable in many applications.
- Difficulties in bed clinkering from poor temperature control.
- Sensitivity to coal type, i.e., occasional need for hand poking when caking coals were used, even though the fuel bed was mechanically stirred.
- Sulfur content of the gas was objectionable in some applications even fifty years ago.

- Restriction to small size, with associated high cost of labor and equipment for large power usage.
- The increasing availability of cheap natural gas.

The real innovations in coal gasification technology started around 1920 in Europe, where coal was the principal source of energy and where there was an incentive to develop processes for making low-cost synthesis gas from coal for use in the production of ammonia and synthetic liquid fuels.

The basic concept of today's Lurgi coal gasification process were developed from the Lurgi coking operation. Other process developments include the Koppers-Totzek, Winkler, Calusha, Wellman-Lord, and McDowell-Wellman processes. In a period of about 50 years, major advances in coal gasification have occurred; in the use of oxygen; in operation at high pressure; in the use of fluidized bed and particle suspension systems; in operation under slagging conditions; in the use of fluids, solids, and liquids as carriers of heat for the gasification reactions. Today most of the devel-

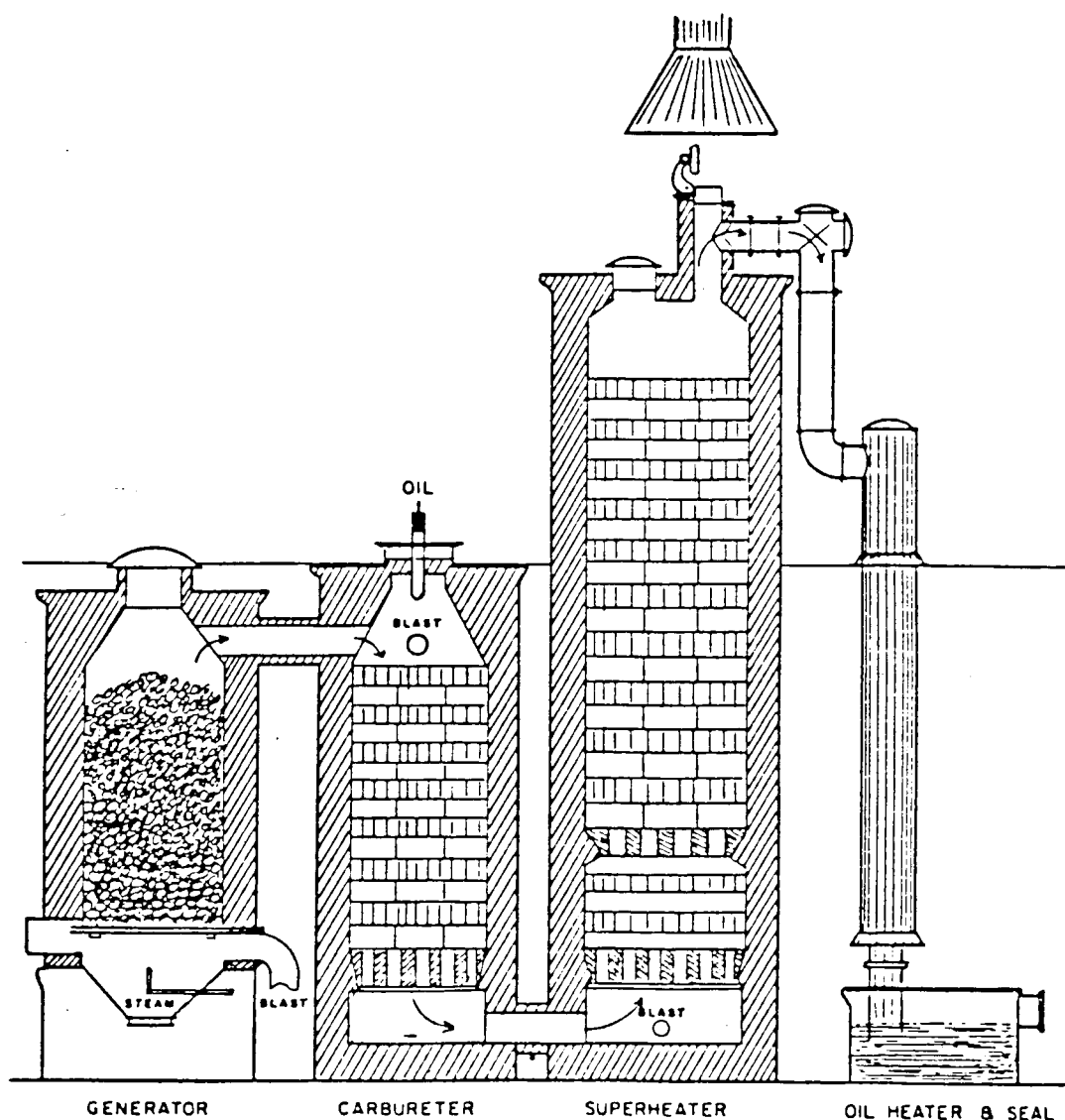


Figure 3 — Lowe's carbureted water gas process — circa 1875.⁽⁷⁾

opment in coal is being done in the United States, rather than in Europe as it was 40 or 50 years ago.

References

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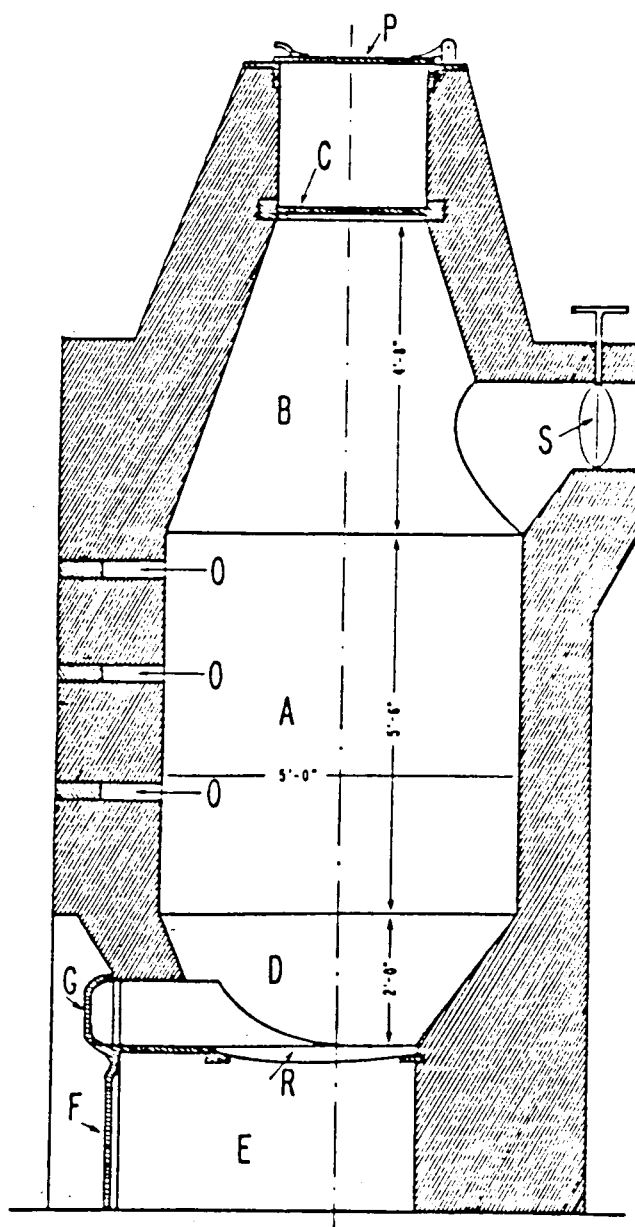


Figure 4 — Bischof gas producer — circa 1839.⁽²⁾ Legend: furnace body, A: upper furnace area, B: damper, C: lower furnace area, D: ash pit, E: Iron plate with apertures, F: door, G: observations parts, O: Ild, P: grate, R: valve, S.

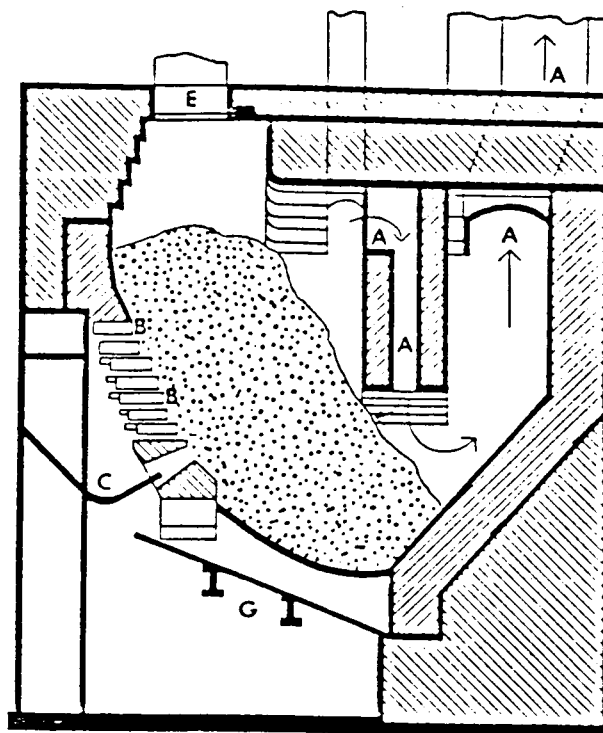


Figure 5 — Siemens gas producer — circa 1857.⁽⁷⁾ Legend: routes of escaping gas, A: step grate, b: steam injection pipe, C: coal introduction point, E: grate, G.

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MALCOLM
PIRNIE

OFF - SITE RECONNAISSANCE

Date: MARCH 7, 1985
ELIZABETH COAL GAS SITE Z Time In 10:09 Out 10:50Site ID No. Z39Site Name: ELIZABETH COAL GAS SITE Z VIGOR HILL COALLocation: 406 SOUTH STAddress: ELIZABETH, NJCity, County: UNIONZip: 07202Personnel: TONY RUSSOTitle: Envir. ScientistNICK ROTONDACivil EngineerConditions: SHINY CLEARTemperature: 40°CAny evidence of imminent hazard? NoIllegal Dumping? NoUncapped Monitoring Wells? No

If Yes, Notify NJDEP

Signature: Nicholas C. RotondaDate: MARCH 7/85Witness: Anthony RussoDate: 3/7/85

Site: ELIZABETH GAS WORKS

Site ID No. 239

Date: 3/7/85

FOUND COAL AND ~~WASTE~~ WASTES IN NEWLY ~~EXCAVATED~~ EXCAVATED AREA FOR RE-ROUTING OF ELIZABETH RIVER. FORMER RIVER ROUTE IS NOW BEING MAINTAINED AS A DRAINAGE AREA. THESE AREAS ARE LOW LYING AREAS ADJACENT TO FORMER SITE. ON THIS DAY HAS WHAT APPEARS TO BE AN OILY SHEEN ON WATER. ~~WASTE~~ ^{SALVAGE YARD} IS AT ADDRESS GIVEN. TWO OLD RED BRICK BUILDING ARE IN MIDDLE OF HAULING YARD OLD ARCH. IT IS POSSIBLE THAT THESE STRUCTURES ARE FROM ORIGINAL COAL GAS SITE. THIS IS NOT CONFIRMED AT THIS TIME. BACK OF PROPERTY IS VACANT. THIS MAY BE WHERE DEMOLITION HAS TAKEN PLACE. VIADUCT CUTS RIGHT THROUGH SIDE AND OVER CORNER OF BUILDING. BACK OF PROPERTY IS LOW LYING AND HAS A BASEBALL FIELD ON IT.

Signature:

Malcolm P. P. F. L.

Date:

MARCH 7, 1985

Witness:

Anthony P. P. F. L.

Date:

3/7/85

Subject: ELIZABETH GAS WORKS Site ID No. 239Date: 3/2/85 Page No.ASA: 200

Frame No: Object photographed:* Location of photographer:* Compass heading:

6 ENTRANCE TO SOUTH SOUTH
HAULING YARD

7 BACK OF PROPERTY, FENCES ALONG RIVER EAST
OFF

8 SIDE OF BUILDING ALONG RIVER EAST

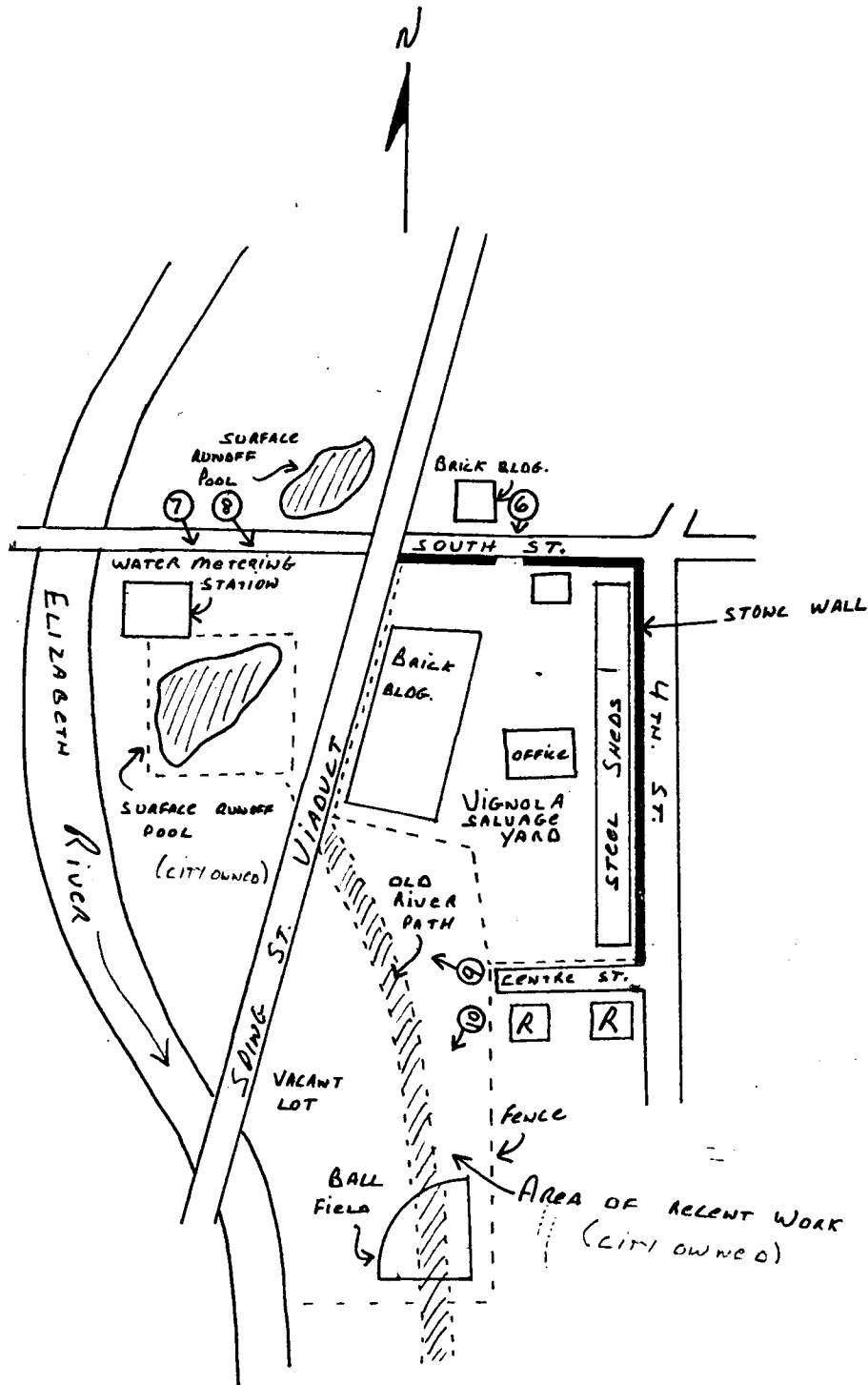
9 LOW LYING AREA END OF CENTRE ST. NORTH WEST

10 11 11 WEST

11 EAST

*Indicate on sketch or map if possible

Signature: Malcolm P. Pirnie Date: MARCH 7, 1985Witness: Andrew Brown Date: 3/2/85



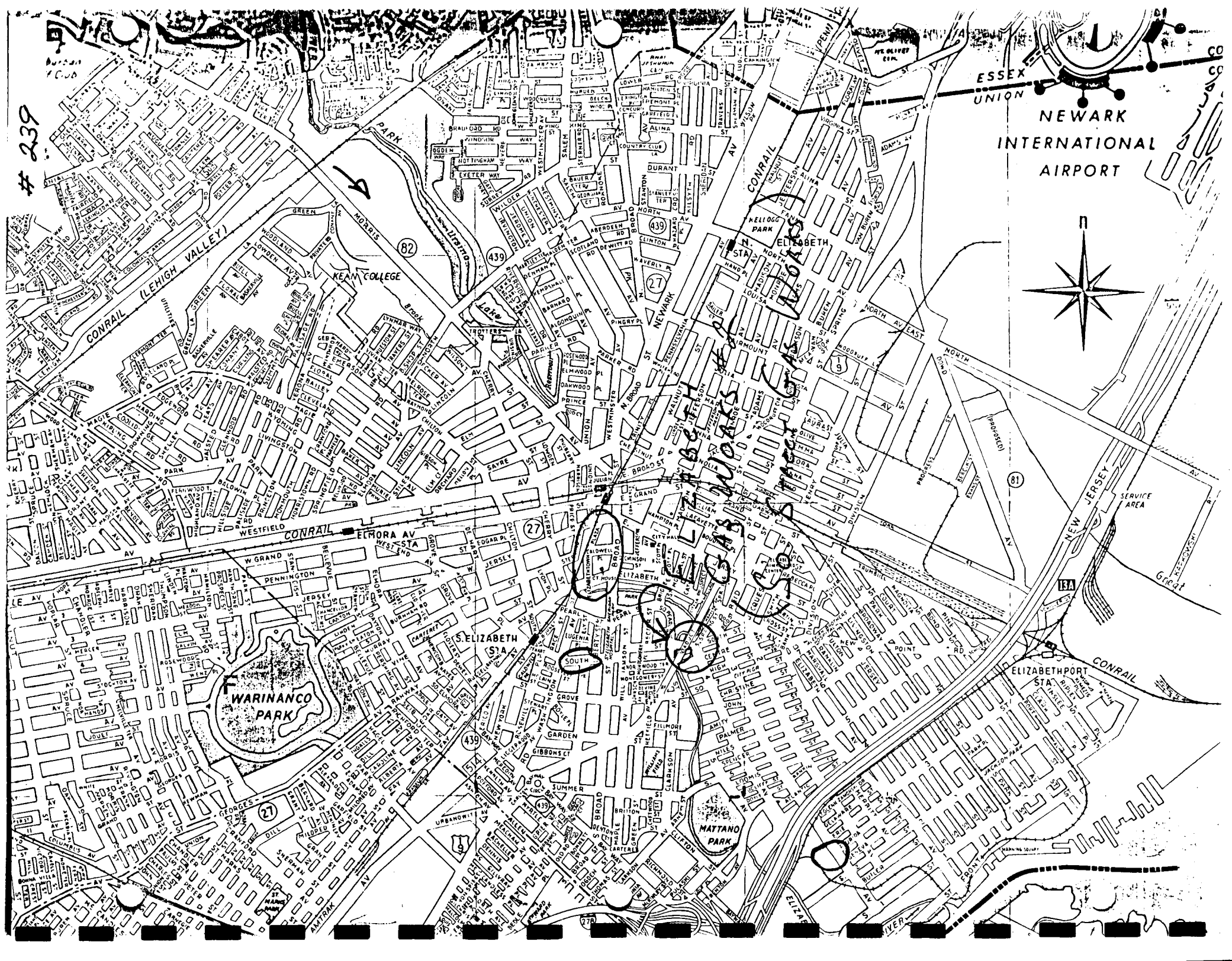
[R] = RESIDENCE

Signature: Nicholas C. P. [Signature]

Date: MARCH 7, 1985

Witness: [Signature]

Date: 3/7/85



MALCOLM
PIRNIE

SITE NAME: ELIZABETH COAL GAS SITE # 2

ID NO: 239

LOCATION: ELIZABETH

FILE	SEARCH DATE	REVIEWER	RCRA 3001 FORM	CERCLA 103C FORM	PRELIMINARY INSP. REPORT	FIELD INSPECTION REPORTS	AGENCY INTERNAL REPORTS	RESP. PARTY MEMOS	FORMAL CORRESPONDENCE	SITE SKETCHES	ANALYTICAL DATA	SECOND SEARCH DATE	REMARKS	QA CHECK
H.S.M.A Trenton	2/6/85	PA							✓	✓				

CODES:

- ✓ REVIEWED AND COPIED
- X REVIEWED BUT NOT COPIED
- NF NOT FOUND

MALCOLM
PIRNIE

Preliminary Assessment Photo Log

SITE: Elizabeth Coal Gas #2

I.D. 239

DATE: March 7, 1985



FRAME: 6 TIME: _____ DIRECTION: South

DESCRIPTION: Entrance to hauling yard

SITE: Elizabeth Coal Gas #2

I.D. 239

DATE: March 7, 1985



FRAME: 7 TIME: _____ DIRECTION: east
DESCRIPTION: Back of property, Along river



FRAME: 8 TIME: _____ DIRECTION: east
DESCRIPTION: Back of property, building on-site